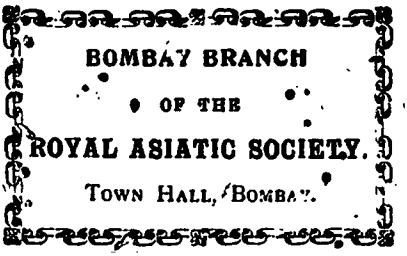
00087651



Digitized with financial assistance from the
Government of Maharashtra
on 15 March, 2016

THE

NATURALIST'S LIBRARY.

EDITED BY

SIR WILLIAM JARDINE, BART.,
F.R.S.E., F.L.S., ETC., ETC.

VOL. VII.

MAMMALIA.

WHALES, &c.

BY ROBERT HAMILTON, ESQ., M.D.,
F.R.S.E., M.W.S., ETC.

87651

EDINBURGH:
W. H. LIZARS, 3, ST. JAMES' SQUARE;
S. HIGHLEY, 32, FLEET STREET, LONDON; AND
W. CURRY, JUN. AND CO., DUBLIN.
1843.

ALDROVANDUS.

Engraved for the Naturalist's Library.

THE

NATURALIST'S LIBRARY.

MAMMALIA.

VOL. VII.

Polecats.

EDINBURGH:
W.H. LIZARS 3 ST. JAMES SQ.RE
LONDON: S. HIGHLEY 32 FLEET STREET
DUBLIN: W. CURRY JUN.R & CO.

00087651

HISTORY

OF

BRITISH QUADRUPEDS.

ILLUSTRATED BY THIRTY-FOUR PLATES,
WITH MEMOIR AND PORTRAIT OF
ULYSSES ALDROVANDI.

BY

WILLIAM MACGILLIVRAY, A.M., F.R.S.E.

MEMBER OF THE WERNERIAN NATURAL HISTORY SOCIETY OF EDINBURGH;
OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, OF THE
LYCEUM OF NEW YORK, AND CONSERVATOR OF THE MUSEUMS
OF THE ROYAL COLLEGE OF SURGEONS OF EDINBURGH.

EDINBURGH:

W. H. LIZARS, 3, ST. JAMES' SQUARE;
S. HIGHLEY, 32, FLEET STREET, LONDON; AND
W. CURRY, JUN. AND CO. DUBLIN.

1838.

ADVERTISEMENT FROM THE PUBLISHER.

It has been our practice, as it is truly our delight, to adopt this mode of announcing the new volumes of this work, and upon no occasion have we experienced more pleasure than we now do in calling the attention of our numerous patrons to the present volume by our friend Mr MacGillivray, which has been so long of making its appearance, after having been so repeatedly announced. The public, and we, are well aware how constantly his time is occupied with his more immediate duties as Conservator of the Museums of the Royal College of Surgeons, as well as his other extensively useful avocations, and therefore excuse the many disappointments we have experienced in the protracted appearance of the British Quadrupeds, which we trust will afford a rich treat in the pictorial. We take this opportunity to offer him our best acknowledgments for the use of his characteristic drawings, from which, in several instances, the plates

have been taken. The Memoir prefixed to the volume is from the pen of a gentleman to whom we have been indebted on other similar occasions.

Our next volume embraces the natural history of the *Marine Amphibia*, by Robert Hamilton, Esq., M.D., author of our volume devoted to the Cetacea or Dolphins, Porpoises, &c., and we hope that our readers will esteem it one of the most interesting and original in the whole range of subjects yet touched upon in the Naturalist's Library.

We are glad to have it in our power to announce two volumes upon Dogs, by Colonel Hamilton Smith; the one devoted to the natural history of the Wild Species, and the other chiefly to the Domestic, Agricultural, and Useful Breeds.

The volume on Bees, by the Rev. William Dunbar of Applegarth, is now in the press, and will be enriched with a Memoir and original Portrait of Huber.

Other volumes are in preparation, and will in due time be announced.

CONTENTS

OF

VOLUME SEVENTH.

	PAGE
MEMOIR OF ULYSSES ALDROVANDI,	17
BRITISH QUADRUPEDS,	59
Synopsis of British Quadrupeds,	62
CHEIROPTEROUS ANIMALS, OR BATS,	6
The Greater Horse-Shoe Bat, *Rhinolophus Ferrum-equinum.* Plate I.	78
The Smaller Horse-Shoe Bat, *Rhinolophus Hipposideros,*	81
The Barbastelle Bat, *Barbastellus Daubentonii,*	83
The Long-eared Bat, *Plecotus auritus.* Plate III.	85
The Whiskered Bat, *Vespertilio mystacinus,*	90
The Reddish-grey Bat, *Vespertilio Nattereri,*	92
Daubenton's Bat, *Vespertilio Daubentonii.* Plate IV.	94
Notch-eared Bat, *Vespertilio emarginatus,*	96
Mouse-coloured Bat, *Vespertilio myotis,*	99

PAGE

Bechstein's Bat,
Vespertilio Bechsteinii, ... 101

The Common Bat, or Pipistrelle,
Scotophilus murinus. Plate II. . . 103

The Serotine Bat,
Scotophilus serotinus, . . 108

The Noctule, or Great Bat,
Scotophilus Noctula, . . 110

The Hairy-armed Bat,
Scotophilus Leisleri, . . 112

The Parti-coloured Bat,
Scotophilus discolor, ... 114

INSECTIVOROUS QUADRUPEDS, ... 116

The Hedgehog,
Erinaceus Europæus. Plate V. . . . 118

THE SHREWS, ... 121

The Common Shrew,
Sorex araneus. Plate VI. . . . 123

The Water Shrew,
Sorex fodiens, ... 126

The Oared Shrew,
Sorex remifer. Plate VII. . . 130

The Common Mole,
Talpa Europæa. Plate VIII. 133

CARNIVOROUS QUADRUPEDS, . . . 143

The Badger,
Meles Taxus. Plate IX. . . . 148

The Fitchet, or Foumart,
Mustela Putorius. Plate X. . . . 152

The Stoat, or Ermine,
Mustela Erminea. Plates XI. and XII. 150

The Weasel,
Mustela vulgaris. Plate XIII. . . 163

PAGE

The Marten,
Martes Foina. Plate XIV. . 166

The Common Otter,
Lutra vulgaris. Plate XV. 174

The Common Fox,
Vulpes vulgaris. Plate XVI. . . . 182

The Wild Cat,
Felis Catus. Plate XVII. 188

THE SEALS, ... 196

The Common Seal,
Phoca vitulina. Plate XVIII. . . 199

The Greenland or Harp Seal,
Phoca Grœnlandica. Plate XIX. . . 209

The Great Seal,
Phoca barbata, ... 212

The Grey Seal,
Phoca Gryphus, ... 214

The Walrus,
Trichechus Rosmarus. Plate XX. . . 219

RODENTIA, OR GNAWING QUADRUPEDS, . . 225

The Red or Common Squirrel,
Sciurus vulgaris. Plate XXI. . . 229

The Dormouse,
Myoxus avellanarius. Plate XXII. . 234

The Black Rat,
Mus Rattus. Plate XXIII. . . . 238

The Brown Rat,
Mus decumanus. Plate XXIV. . . 243

The Domestic Mouse,
Mus Musculus. Plate XXV. . . . 250

The Wood Mouse, or Long-tailed Field Mouse,
Mus sylvaticus. Plate XXVI. . . 254

PAGE

The Harvest Mouse,
Mus messorius. Plate XXVII. . . 257

The Water Vole, or Water Rat,
Arvicola amphibius. Plate XXVIII. . 260

The Brown Field or Vole,
Arvicola agrestis, ... 266

The Red or Meadow Vole,
Arvicola pratensis. Plate XXIX. . . 271

The Common Hare,
Lepus timidus. Plate XXX. . . . 274

The Irish Hare,
Lepus Hibernicus, ... 279

The White or Changing Hare,
Lepus variabilis. Plate XXXI. . . . 282

The Rabbit, or Burrowing Hare,
Lepus Cuniculus. Plate XXXII. . . 286

RUMINANTIA, OR RUMINATING QUADRUPEDS, . . 291

The Deer, ... 294

The Red Deer, or Stag,
Cervus Elaphus. Plate XXXIII. . 296

The Roe Deer,
Cervus Capreolus. Plate XXXIV. 304

The Square-tailed Shrew,
Sorex tetragonurus. Appendix, . . 308

Portrait of Aldrovandi, ... 2

Vignette title-page. The Polecat, or Foutmart, and Water Hen, ... 3

In all Thirty-six Plates in this Volume.

MEMOIR

OF

ULYSSES ALDROVANDI.

MEMOIR

OF

ULYSSES ALDROVANDI.

At the close of that long and dreary period so well known under the characteristic appellation of the dark ages, it was to be presumed that the Science of *Natural History* would not be the last to ensure a cordial and efficient entertainment, in that happier and brighter era which then dawned upon our race. The high character of the great Stagyrite and of the elder Pliny, and their numerous and important writings, embellished with literary attractions of the highest order, all tended to enhance the inherent interest of that fascinating pursuit, which had been to these great men the grand object of their thoughts, of their adventurous travels, and of their chequered lives. When to the interest thus conferred upon the subject, we add the numerous and varied fields of investigation it embraced, and con-

sider how much it bears upon the daily business and pleasures of mankind, we cannot wonder that it soon attracted a band of warm admirers and zealous votaries, who excited the curiosity, and gratified the taste, of their own and succeeding times.

We have been struck with some rather remarkable points of similarity in the history of the more illustrious naturalists, who, in the 16th century, devoted themselves to the revival and prosecution of this delightful science. Five of these have been distinguished as pre-eminent, viz. Rondelet, Salviani, Belon, Gesner, and last, though not least, Aldrovandi. All of these distinguished men appeared at the earlier part of the century, and entered upon the stage of life within a very few years of each other; the first four, indeed, within a period of ten years. Again, these same four individuals bade adieu to this fleeting state of being within eight years of each other, and that in the vigour of matured life, ere any of them reached the age of threescore years. Nor can we regard it otherwise than singular, that the obscure and difficult department of Ichthyology should have taken the lead in the infancy of the science, and should have procured from nearly the whole of these naturalists a most marked and peculiar preference. This is especially true of the two earliest [illegible]ors, Rondelet and Salviani, who treated solely on Fishes. Belon's first productions were on the same subject, though he subsequently distinguished himself in Botany and other departments. The remaining two took a wider range; though

his History of Fishes was the work which procured the patronage of the Emperor Ferdinand I. for the Swiss Zoologist. Aldrovandi's life presents a contrast to that of his eminent contemporaries, in the important point of its duration. Without perhaps superior abilities or opportunities, but with an energy and perseverance of application which knew no bounds, this venerable individual laboured most assiduously to the last, and thus acquired a celebrity which has been obtained by few. He was soon familiarly designated as the modern Pliny; by Haller he is characterised as the most skilful naturalist of his time; and by the learned Bayle he is described "as the most inquisitive man in the world with regard to Natural History."

But when an individual, however illustrious, is separated from us by the lapse of centuries, it is no matter of astonishment if the finer traits of his character, and many interesting incidents of his life, are found somewhat obscured in the distant horizon. This remark applies to the subject of our present memoir. Commencing his career more than three hundred years ago, we are scarcely to expect those full details which are so gratifying concerning our contemporaries and more immediate predecessors. After every allowance, however, has been made on this account, we must still express our disappointment that in turning to the most respectable sources of information, we find a meagreness of detail, and a degree of positive uncertainty, even respecting the most important particulars, in our Naturalist's life

which is wholly inexplicable; while the brief notices we possess have been obtained by servilely copying from a very few original, and not very satisfactory, sources of information. It may be doubted whether, under any circumstances, it be now possible to recover much of that information which we desiderate. But with his own hand our Naturalist has reared his mightiest and most durable memorial; and from the total want of satisfactory information in any other quarter, we have been driven to his own works, obscured with the dust of centuries, and thence have chiefly drawn materials for the following sketch.

Ulysses Aldrovandi was born in the ancient, and at that time very distinguished, city of Bologna. The year of his birth seems involved in some degree of uncertainty, which, except as bearing on the history of the last years of his existence, would be a matter of no great moment. Two dates are mentioned, viz. the years 1527 and 1522; and these have probably been fixed upon by calculating backwards from his supposed age at the time of his decease, which happened in the year 1605. According to the former, and now we believe the prevailing belief, he attained the age of seventy-eight; according to the other, and as it appears to us more probable computation, he reached the age of eighty-three,—a good old age, and passed in circumstances of more than usual interest and excitement.* We

* According to Baron Cuvier (Biog. Univ.) and many others,

ought to add, that, according to Isaac Bullart, he died at the age of eighty.*

His extraction was noble; being descended, according to his contemporary, Aubertus Miræus, from the illustrious family of the Counts of Aldrovandi.† In the dedication of one of his works to Pope Clement VIII. our author claims consanguinity with that respected ecclesiastic, and derives their common origin from the famous Lombard general, Hildebrand. His education seems to have been conducted partly in his native city, and partly at Padua. The correctness of some of his religious opinions having been suspected, he travelled to Rome in the year 1550, for the purpose of vindicating himself, which must have been effected without difficulty; and then he availed himself of the opportunity of studying the antiquities of the place, and composed a treatise upon ancient statuary, which appears to have been his first production, and which was published in the work of his friend Lucio Mauro, on Roman Antiquities.‡ On this occasion he became acquainted with the celebrated Rondolet, already mentioned, and this distinguished Frenchman's researches into the History of Fishes may have had

he was born in 1527. In Rees' Cyclopædia, again, most respectable authority, the date given is 1522, and the age is stated at 83. On turning to the older authorities of Moreri and Bayle, we find no specification given by these authors, other than the date of his decease, and nothing is said of his age.

* Acad. des Sciences et des Arts, t. ii. p. 110.

† De Scriptoribus Sæculi, xvi. pars 2, p. 244.

‡ Rees' Cyclopæd.

some influence in increasing his own very decided predilections for the pursuits of Natural History. Upon his return home, he engaged in the study of Botany, and afterwards went to Pisa, to obtain the valuable assistance of Professor Ghini.

Having taken his degree in Physic at the university of Bologna in 1553, he was in the following year appointed to the Chairs of Philosophy and Logic, and also to the lectureship on Botany.* It is also stated, that he now became occupied with the laborious professional duties of the healing art; and Bullart affirms, that he likewise taught Physic within the walls of the university. Thus, then, we find Aldrovandi settled down at the age, according to our reckoning, of thirty-two, in the honourable character of medical practitioner in his native city, and also in the not less responsible and still more distinguished capacity of professor of several branches of science in its celebrated university.

But in addition to the chairs thus said to have been filled by him, not all at one time probably, but in succession, we have now to mention a fact which does not appear to be stated in any of the modern biographies, although established on the most satisfactory authority, viz., that, about the time under review, he was also elected Professor of Natural History. It may be true, indeed, that this situation was included in the first appointment he received, viz., the Chair of Philosophy; and this might the more

* Reen, u. s.

plausibly be urged, as it appears that, in the language of the time, Natural History was included under the more general title of Natural Philosophy. Instances of this use of the words will occur in these pages. But though this is a possible, we scarcely consider it a very probable explanation; because there is good reason to believe that Natural Philosophy held a more general and earlier place in the curriculum of the different universities than did Natural History; and also because, however natural a union or association Natural Philosophy might form with Logic, a study to which our Professor, as we shall find, was passionately attached, yet there is no such bond or connection between it and the pursuits of Zoology.

But be this as it may, we repeat, there is the most irrefragable evidence that Aldrovandi, at an early period of his life, occupied the Chair of Natural History. In the title of the first volume of his great work on this subject he designates himself by appellations of literary distinction somewhat different from those in present use, as Philosopher, and Physician of Bologna, and Professor of Natural History in its university. *Historiam Naturalem in Gymnasio Bononiensi Profetentis.* And did the fact, amid the silence of the moderns, require any additional confirmation, it would be found in the words of, so far as we know, his oldest biographer, and the only one, we have observed, who has noticed the circumstance. Miræus combines the statement of the fact with a compliment conceived

in somewhat singular terms. "He filled the Chair of Natural History in the university of Bologna so successfully, that he appeared to bear away the palm of distinction not only from those who lived before him, but from those also who should succeed him"—*ut omnium ante se genitorum diligentissimus, etiam post futuris hujus palmæ gloriam præripuisse videatur.*‡

And we the less wonder at this elegant compliment, as our naturalist, in occupying this department of science, found himself in that situation which was most congenial to the earliest bent of his genius, and the enthusiastic prepossessions of his whole soul. This we can fortunately exhibit on his own testimony, and that of scarcely less competent witnesses. And if these his sentiments be produced somewhat at length in his own words, and in those of his intimate friends, we feel that no apology is required, as, beyond all question, these are the most authentic vouchers of the truly philosophic ardour of our distinguished Naturalist. We may remark in passing, that it seems highly probable that he soon vacated his chairs of Philosophy and Logic; while those of Botany and Physic he probably retained.

Having occasion, at an advanced period of his life, to allude to the labours of his immediate predecessors in the prosecution of Natural History, Aldrovandi gives the following account of himself:

‡ Miræus, Loc. cit.

"From my earliest childhood I esteemed nothing more than this noble study, nor do I believe there is any other subject, which can more favourably or clearly display the attributes of the Deity, exhibiting at once His Almighty Power, His excellent goodness, and His unsearchable wisdom. Wherefore, immediately after having tasted of the politer studies, and after devoting myself for seven successive years to the civil and canon law, I made such proficiency that I was urged to accept the badges of its highest honours. But having tasted the elements of philosophy—viz. those which are found in Logic—I was so much delighted with the study, that, contrary to the advice, and the opposition of my friends, I bade farewell to jurisprudence, and gave the preference to philosophy; with which philosophy, when I perceived it consisted in the particulars above enumerated, impelled by strong inclination, I was most eager to become familiar. I therefore directed my views to these pursuits, as to my earthly *summum bonum*. To it I devoted every word and every action, in fact, my whole labour; and was like the mariner directing his course by the polar star; not forgetting the precept of the Stoics, that every man should have some fixed goal unceasingly before him."*

These sentences throw considerable light on the history of Aldrovandi's early years. For it thus appears, though not a hint of the fact is to be found

* Opera, t. i. Præfati.

in the ordinary sources of information, that for a period of no less than seven years his mind was disciplined in the severer studies of the law; and that it was not till after he had distinguished himself by unusual proficiency in that department of learning, that the native bias of his mind at length prevailed over every consideration of interest, and impelled him to still nobler pursuits.

At a later period of his life we find our author giving utterance to the following sentiments:—"I had scarcely begun to taste the sweets of study, when I found that I must keep one sole object before my eye, according to the ancient Greek saying—οὐδὲν γλυκύτερον ἢ πᾶν εἰδέναι—*nothing is sweeter than to know all things.* Not, indeed, supposing that I could attain universal knowledge, for this is beyond human power, but feeling I must exert every nerve with the greatest ardour in the pursuit of learning. Laying aside, therefore, all other business and cares, I devoted myself entirely to study; not only in making myself acquainted with the best authors, but in making their sentiments my own. Accordingly spared no labour in making myself as great a proficient as possible in that study, among others, which treats of natural history: for this kind of knowledge leads not only to honour and renown, as do others, but is accompanied with the most exquisite gratification and astonishment. It is indeed true, that there is nothing more sublime, nothing more worthy of men of noble and ingenuous minds, than to investigate the secrets of Nature, and to endeavour to become

acquainted with those matters with which the Almighty alone seems to be familiar."*

We shall gratify our readers with one more of these delightful extracts, which, while exhibiting our Naturalist's general habits, bears more particularly upon the insect world. "What my labours have been, and to what lengths I went, I could wish you to judge; and when I reflect on the many days I have given to this study, and what expenses I have incurred, I cannot but wonder how I have been able to obtain possession of, and to examine, and to describe, such a number of minute creatures. For the attainment of my object, I was in the habit of going into the country for months, during the summer and autumn, not for relaxation, like others; for at these times I employed all my influence, as well as money, to induce the country-people to bring me such insects, whether winged or creeping, as they could procure, in the fields or under ground, and in the rivers and ponds. When any was brought me, I made inquiries about its name, habits, locality, &c. I often, too, wandered through the vineyards and fields, over the marshes and mountains, accompanied by my draughtsman and amanuenses, he carrying his pencil, and they their note-books. The former took a drawing if expedient, the latter noted down to my dictation what occurred to me, and in this way we collected a vast variety of specimens."†

* Opera, t. ii. Dedicat.

† Opera, t. iv. Ad Lector.

The expressions which occur in the above passages accord with the fact that the Science of Natural History, though naturally dividing itself into distinct fields of investigation, had not at the time now under review made such advances as to have procured votaries who confined their principal attention to some favourite department. Hence we find that the whole interminable field opened up to our professor's view, so vast that it would have daunted any other energies save his own. On his mind, however, the extent of the subject only produced the opposite effect; and he almost seems to have aimed at the endeavour of investigating and describing the whole range of Nature's works.

It is only reasonable to suppose that a man who appreciated so highly the favourite object of his studies, who prosecuted it with such unwonted ardour, and wrote with such burning enthusiasm, could not fail to impart something of the same temper to others, and would be especially calculated to become at once a most useful and popular public teacher. This matter, however, is not left to conjecture, as we have the direct testimony of Uterverus, the friend and immediate successor of Aldrovandi; whose words are these: "Every one is aware of the celebrity which Aldrovandi has acquired in his public prelections in illustration of Aristotle, Theophrastus, Dioscorides, and Galen, illustrations which have been heard with the highest delight by his auditory. Nor is less praise due on account of the demonstrations which he gives, both in the pub-

lic garden and in his private dwelling, concerning fossils, and animals, and plants, of which he has an admirable collection." He also correctly attaches the names, and describes the nature and properties of them all."*

It has already been stated, that about the year 1553, and when we suppose Aldrovandi had attained the age of thirty-one, he was appointed to the Chair of Botany. Of this department of science, as of all the rest, he seems to have been a most assiduous cultivator. He had the honour and happiness of establishing the Botanical Garden of Bologna, in the year 1567. The accomplishment of this important enterprise at this early date must have exerted a powerful influence on the celebrity of the university and the progress of the science. It must have proved a useful stimulus at the time, and must have been permanently useful in disseminating a love of the science throughout Europe. We have no reason to suppose that our Philosopher ever abandoned this fascinating study. At all events, it is recorded by Haller that his *Hortus Siccus*, or collection of dried plants, which filled sixteen large folio volumes, was still in existence nearly a century after the collection was formed; and the result of some of his labours in this science was published at a later period in his "Dendrology," a massy folio, to which our attention will in the sequel be more particularly directed.

* Uterverus, Recommend. in Opera, t. ii.

But the establishment of the Botanic Garden was not the only monument of his influence and zeal which Aldrovandi left behind him. We have already learnt, that, with a little corps of assistants, he was in the habit of making scientific excursions into the surrounding neighbourhood. On these occasions he collected innumerable specimens, and these he took every pains to preserve. This then was the *formation of a Museum*, to which object he devoted himself with all his wonted energy. It animated his personal studies, and illustrated his lectures; it extended his own views, and could not fail to infuse far and near a taste for these pursuits, and it ere long formed the ground-work of his voluminous "Opera." On these points let us hear himself:— "Observing that many errors had crept into the works of the most distinguished writers, such as Pliny, Avicenna, &c., in order that I might gain information with regard both to the internal and external structure of the objects I was to describe, I laid out a large sum of money in various travels into the different parts of the world, undertaken chiefly in reference to birds and other departments of Natural History. Nor has less trouble been taken in describing them, in assigning them their peculiar colours, and in delineating them upon tablets made of the pear tree; afterwards in engraving them, (*exculpendisque*,) and finally in giving them to the public. For these purposes I retained the services of one celebrated painter for more than thirty years, at an annual salary of not less than two hundred golden

pieces, (crowns.) I also employed the most celebrated draughtsmen, *(delineatores,)* L. Bennini a Florentine, and C. Swint of Frankfort, who superintended my engravings; and at Florence, the Duke of Tuscany's famous painter, J. Ligoti, to delineate the birds in the most exquisite manner possible. Finally, I have wood-cutters, *(sculptores,)* and especially the illustrious C. Coriolanus of Nuremberg, and his nephew, who carved them so beautifully, that they appeared not to be represented in wood, but in brass."*

In these words Aldrovandi speaks in very specific terms of his travels; and of these it would be interesting to have a more particular account, and to trace the impressions made upon his ardent mind by the novelties they brought under his view. We have already seen his native energy displayed during his short sojourn at Rome, which he signalized by his treatise on ancient statuary; and possibly a minute examination of his writings would exhibit other traces of his footsteps. Among the notices of his works, we find that in Jordanus, there is "a letter of our author, in which *he treats of Egyptian Buildings.*"† How he came to dilate on this subject we have been unable to discover, and the circumstance scarcely supplies ground for the conjecture that he visited the Country of the Pyramids, although his writings prove he was intimately

* Opera, t. i. Præfatio.
† Bibl. Anat. ii. 747.

acquainted with its most recondite mythology. In this lack of circumstantial information, we turn in vain to his several biographies, which, although they speak generally of his travelling, yet do not supply a single particular as to the scenes and countries which he visited. Mirœus, indeed, associates his devotedness to travel with his medical pursuits, and in this connection there was probably some truth. "Attaching himself to that department of Physic which describes the articles procured from animals, in order that he might transmit to posterity the figures, characters, and dispositions of these animals, not content with the examination of the accounts of others, he travelled himself into the most distant countries that he might subject them to personal observation."* Bullart's account is somewhat more florid. "Aldrovandi endeavoured to render his name famous, by exhibiting in his learned writings all the wonders which are represented on the theatre of the world. Animated by this generous motive, he took long voyages to observe the form, dispositions, and qualities of the animals and plants of every country. He likewise penetrated into the interior of the earth to discover the virtues of minerals; he carried his regards into the regions of the atmosphere, to watch the tribes which frequent it; he descended into the ocean and into rivers, in pursuit of their inhabitants; and, finally, re-ascended into the skies to examine

* Loc. cit.

the constitution of its luminaries and meteors, and their different agencies upon terrestrial objects; in a word, he allowed nothing to escape him which might in any way elucidate external nature."* And, lastly, in the more measured terms of Bayle, "His cares, his labours, and his expenses, in Natural History were incredible. He travelled into the remotest countries without any other motive than that of enquiring into their natural productions: minerals, metals, plants, and animals, were all the objects of his regard."†

Aldrovandi did not suffer any of his journies, or the fruits of them, to be lost; the whole of his collections, transmitted from every quarter, being most accurately examined, and deposited in his Museum. We have seen above, that the reason which he assigns for his travelling was, that he might be an eye-witness of the interesting phenomena of which he read; and might gain information with regard both to the internal and external structure of the objects of Natural History which he encountered. Many investigations concerning that structure could not of course be accomplished during the hurry of a journey, and much, therefore, must have been reserved for more elaborate examination in the Museum. Nor did he work there alone. Like a man of powerful mind, he instigated others to their own improvement, and that of the science they

* Acad. des Scien. &c. Loc. cit.
† Dictionnaire, &c.

were cultivating. He had able assistants in the use of the pen and the pencil; and the dissecting knife, not less essential to the Naturalist, was actively employed by himself and others. The names of several of his associates in this department of his labours have been handed down to us, and must not here be omitted. The following list is given by the indefatigable Haller:—M. A. Ulmas, J. Buttnerus, J. B. Cortesius, J. C. Arantius, and Coiterus; and we find throughout our author's works due acknowledgments made of the labours of these several individuals, in connection with the more important preparations.

One remark we will here hazard; viz. that in this first of the earlier Naturalists, first in eminence, though not quite in time, we witness not the awkward novice of a barbarous age, but one who may well be regarded as a pattern and example to the most accomplished of modern Zoologists. For what man could do more? Whether we regard him in his study, or in the fields, in his Lecture-room, or his Museum, surrounded by his assistants, his amanuenses, and his draughtsmen, or in his travels over various and distant lands—in all we see the ardent, the indefatigable student of Nature, and one who could not fail to impart a most powerful impulse to science. In spite of that *amour propre* which leads so many men of every succeeding generation to imagine that they have far outstript their predecessors, we see here the master of most of them—the Hunter, the Humboldt, the Cuvier of

his day. Nor are these mere sounding words. Much confirmatory of what we advance remains to be noticed as we proceed, and the utmost we can say may be at once corroborated by a few additional statements. Our Naturalist finally bequeathed his vast store of scientific treasures to the Senate of Bologna, and by this distinguished body it was made the splendid foundation of the great public Museum of that city, where many of the preparations remain to this day. And not less to the point—the vast collection of paintings which Aldrovandi accumulated were thought worthy, so late as during the splendid but despotic rule of Napoleon, of being removed from the venerable halls they had for centuries graced, to Paris, where they were deposited in the Museum of the *Jardin des Plantes*. At the peace of 1814, right and justice resumed their sway; when these remarkable works would, we presume, be restored to their appropriate place, under the custody of the citizens of Bologna. To this we may add, that the prodigious mass of valuable manuscripts which our Naturalist left behind him were preserved, and are still to be seen, in the Public Library of his native city. Among these would probably be found his correspondence with the most illustrious men of his day; but we have not been able to detect a single trace of these most interesting memorials in any of the accounts of this distinguished man which have yet been given to the world.

In fact, we desiderate nothing more in the meagre

biographies of this individual, than those allusions to his private history, and those traits of the retirement of domestic and social life, without which no just estimate can be formed of the character of the man. That he was not a stranger to the bliss of friendship may well be presumed, and that he had many attached and warm admirers will presently appear; but of this charm of life, this "soft green in our thorny path," we know not what share he found. In like manner, on his decease, he left a widow, who, we shall find, speaks highly of his virtues; but how long she had been the companion of his weal and woe, and to what extent the participant of his thoughts and pursuits, we have not learnt. In short, we have scarcely been able to get a single peep into the retirement of his private life; and the only thing like it is the following statement of Bullart, borrowed, we suspect, from words already quoted. "On the return of the sweet days of summer, our Naturalist retired to enjoy the pleasures of the country, betaking himself to a residence he possessed in the neighbourhood of Bologna; and here he collected his friends and associates about him, still, however, only to prosecute his favourite employment."*

But we must hasten to notice what formed the great consummation to which were directed the whole energies of Aldrovandi's soul, and the fondest wishes of his heart. All his drawings, and prepara-

* Loc. cit.

tions, and manuscripts, were only means to an end; and formed in his view merely so many preparations to his grand work on Natural History. Part of this work appeared during his life, and part after his death. It was published in the most sumptuous style, and with a lavish expenditure. When this is added to his previous outlay, it may easily be understood how his private fortune and professional receipts must have been exhausted, and how, like some other zealous Naturalists, he involved himself in pecuniary difficulties, and in actual poverty. That his circumstances were extremely reduced is indisputable. But upon this fact has the statement been engrafted, not only that he ruined himself, but that at length, in the words of Bayle, "he reduced himself to the utmost necessity, and died a neglected pauper in the public hospital of Bologna, loaded with years and blind, a remarkable instance both of public ingratitude and private curiosity. A thousand reflections," adds Bayle, "might be made on this adventure, but these I leave to others." —Nor have these reflections been wanting. The melancholy tale is now repeated in most of our popular accounts, and made the occasion of suitable lamentations over the hardships of deserving authors, and the ingratitude of a selfish public, which will readily enjoy the pleasure, and yet feel no commiseration for the over-zealous individual, who reduces himself to actual starvation for their gratification.

In one of the last notices of our Naturalist's life

which has been published, we find allusion made to the point in the following terms, which, as it clearly expresses the prevailing opinion, we the more willingly quote. "Cuvier, in a notice of Aldrovandi's life, regards this circumstance as doubtful; imagining it improbable that the Senate of Bologna, to whom he bequeathed his Museum and Manuscripts, and who laid out large sums after his death in completing the publication of his works, would have left him destitute during his life. This, however, is mere conjecture; and there is *too much reason to fear* that, like many other eminent men, he was abandoned to struggle with misfortune, and not advanced to honour and estimation, until after his career was finished, when they could be of no use to him." We are glad for the sake of our hero, and of humanity, that our limited investigation induces us to believe, that Cuvier's conjecture is better founded than the fear here so feelingly expressed.

We may first remark, that the doubt expressed concerning the truth of the popular belief, did not originate with Baron Cuvier in the nineteenth century, but was expressed by Baron Haller in the eighteenth; his words are explicit, "*Nostro ævo negatur.*"* "*It is now denied.*" But still there intervened between the times of the great Physiologist and our Naturalist the best part of two centuries. During the intermediate space, we have been unable to obtain any information either with regard to the

* Bib. Anat. t. ij.

origin of the doubt, or the history and prevalence of the opinion. In betaking ourselves to what we may call the original documents, we find both negative evidence against the modern account in a total silence on the subject; and what we cannot but consider positive proof of its inaccuracy, in circumstances which appear to us quite incompatible with the melancholy representation. Bullart's biographical notice was published nearly a hundred years before the time of Haller, viz. in 1682. It is as full as any account we have seen; and though alluding, in due proportion, to the circumstances of Aldrovandi's last days, it is perfectly silent as to the point under review. Miræus, again, takes us more than another century back; for, in fact, he was a contemporary of Aldrovandi, being born in 1573; and in his short and interesting notice there is the same total absence of all allusion to the circumstance, which could scarcely have occurred had the fact been known or believed in his time.* His statement is so touching, that we quote it. "But this man, distinguished by the highest sagacity, who has brought before our eyes the unknown forms of so many animals, seems almost to have been wronged by Nature, as a step-mother, in that in his old age he became blind; and that he who was marked by

* Since writing the above, we find in the curious work of Paul Freherus of Nuremburg, *Theatrum Virorum Clarorum*, &c 1688, an explicit notice of this report—"Retulerunt quidam, quod propter copiosas librorum editiones, ad extremam pauperiem redactus in Xenodochio Bononiensi vitam finierit." (Theatr. p. 1317.)

the perspicacity of his judgment, and who has so strongly illuminated the hidden causes of many things, should spend the last portion of his life—in darkness."* If from these sources of information we turn to the works of Aldrovandi himself, we think there is unquestionable evidence that the representation must be fallacious. Having said this much, we shall postpone any further remarks on the subject till we have put the reader in a position to judge for himself, which will be effected by supplying that short account and history of his works which our limits will permit. Nothing, certainly, at all like a miserable end could have been anticipated from any thing we have hitherto met with in his history, and what still remains is not less incompatible with so melancholy an issue.

Though Aldrovandi's taste for Natural History was early developed, as already stated upon his own authority, yet a variety of circumstances concurred in, for a time, preventing its regular cultivation. His early years were, of course, devoted to those branches of general education which befitted his honourable birth; and thereafter a considerable time was devoted, as we have seen, to the study of Philosophy, Logic, and Law. These pursuits, however, being at length terminated, we find that he devoted himself to his favourite study with an energy which never perhaps has been exceeded. This sufficiently appears from the extracts already adduced.

* Bayle's Dictionary, English Translation.

But let us proceed briefly to exhibit the plan which he early sketched, as the labour and pleasure of his life; and to which he seems to have steadfastly adhered. As already mentioned, his plan of study had relation to a grand and comprehensive publication, with which he was engaged for probably not less than fifty years, and which, though to a considerable extent accomplished by himself, was not finally completed until years after his decease.

In regard to some of these particulars let the author speak for himself. "Feeling that I have been endowed with the talent of investigating the deep secrets of Nature, and that a span of life had been given me sufficiently long for their successful examination, I could not, on reflecting on these blessings received from the Divine Majesty, but endeavour to rear some memorial, however insignificant, of a grateful heart. This I thought I could in part accomplish, if I should leave to posterity the result of what had cost me much labour and expense during my whole life. As I have ever been a determined enemy to idleness, and as I have applied myself to these hidden subjects by day and by night, without much regard to health, and without caring for the colds of dreary winter, or the heats of burning summer, grudging not the most painful labour, as well as my whole and almost undivided time, I have committed my observations to writing, not only on the subject of Natural History, but also on Philosophy and Medicine, and in a way that can scarcely fail to be useful to Philosophers and Phy-

sicians, and generally to learned men. Among these subjects I judge that the first place in the publication should be given to that which treats of animals, as being a nobler subject than the others. For as Plato reckons four great divisions of animals, corresponding to the four elements, earth, water, air, and fire, I think it expedient, upon due reflection, to begin with birds, that division seeming to offer itself first in order; for as to those corresponding to fire, I consider that none such exist. Although certain insects fall under the aerial division, some with conspicuous wings, like the bee, and others with concealed, as the beetle, the order of procedure may well be assigned to birds, which fly with regular and not with membranaceous wings. This subject of ornithology is, indeed, an arduous one, whose very difficulty provokes investigation; for here an aspiring mind may try its strength, and if it succeed, the triumph is neither low nor grovelling, but splendid and honourable; and should failure ensue, the very attempt is noble and commendable. Some perhaps will inquire why I have not commenced with quadrupeds, as this division might seem to claim the first place, as they assist man in his labours, and chiefly supply him with food. My reasons I shall declare on a future occasion, I trust to the satisfaction of the reader. Quadrupeds then will occupy the second place. The third I intend to assign to fishes, the offspring and flocks of the water, including the inhabitants of the wide ocean, along with those which attach

themselves to the rocks, and frequent the shore, and those which are found in rivers, lakes, and ponds. The fourth and last will include the white blooded animals, both those which are serviceable to man, and those which are not. Here I will include many minute animals which were unknown to the ancients, as they are generally at the present day. After this we shall explore the rich fields of the vegetable world, and those of fossils. I may add, that many things will be found in this work, relating to man's life, both public and private, and to the proper establishment and regulation of manners; also remarks of a highly useful character on ethics, on rural and domestic economy, upon politics, and military affairs—remarks which have been gleaned from the ancient monuments of literature. There will also occur many directions for the preservation of health, some of a general nature, and others more especially professional. The linguist, too, will here be supplied with numerous synonyms in almost every known language." *

Here, then, is a plan, remarkable for its comprehensiveness, and, what is not less astonishing, it was accomplished to the very letter, and in a way that will remain a lasting monument of the author's genius. But a few particulars must be added.

As our author has informed us, he gave the precedence to Ornithology, and the first edition of his work on this subject, published at Bologna, extends

* Opera, tom. i. in Præfat.

to upwards of 2600 folio pages, of the largest size, beautifully executed, adorned with some elegant engravings, and with almost innumerable wood cuts, all of them creditable, and many of them of superior merit. It is concerning this work that Haller remarks, "he devoted himself most assiduously to anatomical details."

The first volume appeared in the year 1599, when the author had attained the venerable age of 77. We have room for nothing more than the shortest epitome of its contents, which we give chiefly as a sample of the whole work. And, first, let us again hear the author: "I could wish you to judge how much toil and trouble has been given to this work. I have supplied the names of birds not only in Greek and Latin, but also in Hebrew, Arabic, and Italian, and, in short, in all known languages. I have described the birds, and figured those I have had an opportunity of drawing. I have illustrated their nature and habits, have dwelt upon their food, the manner in which they are captured, and how they may be best preserved; likewise the nourishment they afford, their use in medicine, their employment upon emblems, symbols, and images, in sacred and profane mythology, and on coins, in proverbs, and hieroglyphics. Whatever can be usefully said upon birds may be found here."* The treatise is divided into twelve books. The author begins with the rapacious birds, and after a short introduction, he

* Opera, t. i. Dedicat.

treats of eagles, vultures, hawks, falcons, nocturnal rapacious birds, such as owls, &c. then such as are of a somewhat mixed nature, in which chapter he discusses Bats, and the Ostrich, then Fabulous birds, afterwards Parrots, Ravens, Crows, &c. With regard to the anatomical details, he in this volume, according to Haller, describes the breast and collar-bones of the Eagles, and their whole bony and muscular frame, the Nictitant membrane, and the first rudiments of the pupillary membrane; also the bill of the Parrot, the upper part of which is moveable, and possesses its appropriate muscles; also the tongue of the Magpie, &c. The second volume appeared during the ensuing year, 1600. It is of equal dimensions, and not inferior merit. Among other things, this volume also contains many anatomical details; there is described the process of incubation of the egg, for each day, the *punctum saliens* having been seen on the third day, and the *truncus venosus* arising from it: there is here, too, the skeleton of the Starling, the windpipe of the Lapwing, &c. &c. As a sort of preface to this volume, there is a notice from our author's friend and successor Uterverus, in which he mentions that the former volume has been very flatteringly received; and he adds, "Aldrovandi will, in his own time, augment the public gratification by presenting them with the drawings, illustrations, and history of a great number of plants, known as yet to few, as well as of the white blooded animals, of fishes, quadrupeds, and also of inanimate things." We

quote this chiefly because it seems to show that circumstances had arisen which might lead to an order of publication somewhat different from that which had been originally intended.

If Haller and Baron Cuvier be correct, the next volume which appeared was not the third and last on Birds, published in 1603, but that on Insects, which appeared the previous year, viz. 1602. This would show, that probably different volumes were in preparation at the same time; although from not being able to see the first edition, we have not confirmed the statement. From this volume we extract the following sentiments:—"Of all the departments of Natural Philosophy, the knowledge of which is difficult, the study laborious, and the nature abstruse, that which I have found the most difficult relates to insects. Their extreme minuteness would lead us more appropriately to designate them ἄτομα than ἔντομα, *atoms rather than insects.* And for this reason no one, so far as I know, has published any thing concerning them that is worthy of notice. Aristotle is the only one among the Greeks who has left any thing of value, and though Pliny has collected a few things from others, yet they are so garbled that they are likely only to confuse. I trust, on the other hand, that this book of mine will afford both pleasure and profit: pleasure, that in such minute animals we can observe such wondrous tints, such perfect forms, manifesting extraordinary power, and other qualities worthy of all admiration. With regard to the colouring, such

variety exists that Apelles himself would be unable to rival them; in mental and bodily powers, again, we find that the smallest gnat in Mesopotamia will sometimes vanquish the mighty lion, and an insignificant beetle will make the queen of birds (the eagle) to quail. The bees also, and the ants, to omit many others, surpass other creatures, and even man himself, in art and foresight. From such contemplations we may reap instruction as well as interest. Besides, how many are the luxuries and the remedies which we derive from this source: there is wax and honey from the bee, and silk from the caterpillar, and other things from others. *Ab aliis aliaque.*"[1]

The volume on Serpents likewise appeared in the year 1602. The third volume on Birds seems to have been the last the author lived to publish. It treats of aquatic birds, as of the Swan and Heron, of the lower larynx of the starry Cormorant, &c. &c. The year immediately after his death another very important volume appeared, on what is called white blooded animals, viz. the Mollusca, Crustacea, Testacea, and Zoophytes, 1606; which contains much original matter, as well as exhibits the knowledge of the ancients in this obscure department.

These six volumes, then, appear to have been entirely prepared for the press under the superintendence of Aldrovandi himself: the remaining seven of his "Opera," making thirteen in all, appeared

[1] Opera, t. iv. Ad Lectorum.

subsequently at different times, under the direction of his colleagues and pupils, and, seemingly, in the following order. The volume on Fishes, including the amphibious Mammalia, the Manatee of the West Indies, and the Sea-cat or Phoca, all of which we have engraved, in the year 1612; the volume on Bisulcated Quadrupeds, those which divide the hoof, in 1613; and the two remaining volumes on Quadrupeds, the former confined to solipeds, those with undivided hoof, in 1616. A huge volume on Monsters seems not to have been published till the year 1642. Respecting this volume Haller remarks: "It contains several matters of importance. There is the anatomy of the pike, with a description of the swimming bladder, the liver, and parts of generation; also of the carp with its double air bladder; also of the teeth of the porcupine, and its cœca; also the skeleton of the sow, along with an immense collection and farrago of monsters, with numerous fables attached to them, with some things of real value."* The volume on Fossils, one of the largest of the whole, followed; and, finally, the Dendrology appeared as late as 1668. With a short notice of this volume, by a contemporary critic, we must close our remarks on the contents and character of these ponderous tomes. "There is scarcely any thing written about these trees which has not been collected in this volume; for the author is not satisfied with mentioning all that he had met in Na-

* Biblipt. u. a.

turalists concerning them, but also relates what historians have written, legislators have ordained, and poets have feigned, respecting them. Moreover, he explains their different uses, for economical purposes, in Physic, Agriculture, and the Arts; lastly, he notices the moral sayings, proverbs, devices, enigmas, hieroglyphics, and most other things which relate to the subject."*

We cannot finally, however, leave these *Opera*—"this memorial of a grateful heart"—without attempting to vindicate and defend our Naturalist's fair fame, as to the claims of authorship. The originator of the unjust charge brought against him on this point seems to have been the learned Abbé Gallois, whom we have just quoted. His critique of the "*Dendrologiæ*" begins with these words—"Aldrovandi is not the author of this book, nor of many others which are published under his name"—alluding especially to the last seven volumes which have passed under our notice. The cautious Bayle has allowed himself to be misled by this flippant statement:—"This compilation," he remarks, referring to the *Opera*, "comprehends several large volumes; but the whole honour must not be ascribed to Aldrovandi;" and, in proof, he quotes the passage just produced. Among later writers, therefore, we are not to wonder if we find it is the prevailing notion that Aldrovandi, we will not say is not the author of these works, but only

* Journal des Sçavans, 1658.

that he had a divided and inconsiderable share in their preparation and merit. We believe this criticism is substantially unjust, and wholly untrue. The Abbé thus explains himself—"As the first six volumes were Aldrovandi's, although the others were compiled by various authors after his death, yet they are ascribed to him, *either* because they are continuations of his design, *or* compiled from his memoirs, *or* written according to his plan, *or*, *perhaps* with a view of recommending the latter volumes by so famous a name." But this is all uncertainty and mere conjecture,—the vague and nasty suggestions of one whose very expressions demonstrate a total ignorance of the actual state of the facts.

Aldrovandi early sketched the plan of his "Memorial." He was fifty years in executing it. In his first published prospectus, so to speak, he imagined the treatise on Quadrupeds would precede that on Fishes; to which would succeed the Mollusca, Crustacea, &c. Botany, and Fossils. As early, however, as the year 1600, a change in the order of publication was anticipated, and it was announced to the public as follows—Plants, Mollusca, Fishes, Quadrupeds, and Fossils. This order, we have seen, was nearly followed; with one striking exception, however, viz. as to the Plants, which was the last that appeared. But it is of this work on Plants, which it was anticipated would have taken the precedence of others published during the author's life, that the critic ventures to declare

that it is not Aldrovandi's, and speaks of Ovid. Montalbani as the true author.—"Cet auteur ne se content pas de rapporter tout ce qu' il en a lu," &c. Why, the subject of Botany was that on which our author was more early and more fully prepared than on any other; Botany being the science which he first and for so long taught with the greatest success in the University. The simple statement of these facts refutes the injurious aspersion, and we deem that, nothing more, therefore, need be said regarding it. We think it highly probable that the whole matter of the volume, in Aldrovandi's manuscript, would be found at Bologna at the present time.

In addition to the treatises contained in the thirteen folios we have thus noticed, and the other works we had occasion to mention, we have observed that a few other treatises proceeded from the pen of Aldrovandi. Some of these are named by Haller; and Miræus states, upon the authority of Paulus Mut. (sic,) that he prepared a work for the press, "Upon the Providence of God, as it may be learned from Animals;" in short, a work on Natural Theology. We do not know whether this treatise ever saw the light. We ought also to mention, that second editions of his *Opera* were speedily required, showing their great popularity, and were published at Francfort, as well as Bologna, with much elegance and care. It is now difficult to procure a uniform edition of his works, and some of them are much scarcer than others.

We have thus seen, then, that Aldrovandi, born and reared in affluence, possessed of superior abilities, and with the avenues of professional independence before him, was induced by the bent of his genius, to desert the path of worldly gain, and to dedicate the whole of his fortune, and of his life, to the advancement of a favourite and ennobling study. His means were ere long exhausted, and though it was an element in his calculation, that the profits of one publication would enable him to put forth another, yet in this he proved to be so much mistaken, that he was actually reduced to pecuniary straits and difficulties. He could not, accordingly, proceed with the publication of his own works; nor is this to be wondered at, when we consider their extent. They are really as ponderous as our great modern Encyclopædias. But although he could not bring them before public notice, others, embued with that spirit which he had infused, were both willing and able to do so; and they completed their master's design with a zeal that does honour at once to their friendship and their love for science.

It will not be forgotten that the reading population on Natural History, as on other subjects, was very different in the sixteenth century from what it is in the nineteenth. Hence the real importance of patronage then; and without its help much could not have been effected, which was actually accomplished. But we may hear our venerable Professor himself. "As water to a tree, so is patronage to works of merit. Thus Pliny was indebted to the

patronage of Vespasian, Appian to that of Antoninus, and Aristotle's Commentaries, above all praise, would never have seen the light, had not Alexander the Great exercised his imperial influence, both in their preparation and publication. So is it with thousands of books of the present day. Salviani, formerly my intimate friend, dedicated his work on Fishes to Pope Paul IV. Mathiolus, too, with whom I have had much literary intercourse, dedicated his to the Emperor Maximilian II., and Belon, his treatise on Fishes, to Henri II." With this truth clear before him, our author declined not any assistance which was offered, and gratefully acknowledged his obligation The first volume of his works accordingly was dedicated to Pope Clement VIII., who distinguished men of merit "with the very hand of Mæcenas." It may help to show the elegance with which our author's works were prepared, if we allude to the excellent engraving which forms the title-page. On a tablet on the left is represented the Great Alexander, accompanied with his guards, listening to the aged Stagyrite, and encouraging him to proceed with his immortal work. On the right is the Emperor Vespasian, with the Imperial Eagle and Lictors, doing a similar office for the elder Pliny; and in the centre is our octogenarian, bending at the foot of the Pope, and presenting his massive tome to the aged Clement, surrounded by the Cardinals, in the midst of the imperial city. The second volume, in like manner, is dedicated to Cardinal Montalto, and we are here supplied with

the following information:—"When I had brought myself into difficulties, and was on that account led to employ my patrons, as means of invoking your clemency, you not only assisted me, but conferred benefits of a nature that exceeded my highest expectation, and for which I can never be sufficiently grateful."* In the year 1600, our author gives us the following additional intelligence:—"Pope Sixtus VI., that lover of the good and learned, deigned to place me in the class of literary men, and showed great liberality by increasing my comfort; for, learning from others that I was incurring an expense for the general benefit of the studious beyond my means, he, of his own accord, recommended me so strongly to the Senate of Bologna, that I received from them very considerable remuneration—*mediocres fructus.*"

But by far the most interesting witness in these matters is the widow of Aldrovandi, whom we regret we have not the means of introducing more intimately to the reader's acquaintance. In her dedication of the sixth volume of the *Opera* to the Senate of Bologna, she says:—"Among the illustrious men who have been distinguished by the study of Philosophy and other branches of learning, I allude to no other than Ulysses Aldrovandi your countryman, my husband, who did not occupy the lowest place amongst them, for almost fifty years, and upon whose excellent character, and extensive erudition, I should dwell, were it not well known to you, not

* Opera, t. ii. Dedic. sub. fin.

more by the declared opinions of others, than by his own writings. From the earliest period of life he so delighted in learning, that he spared neither labour nor expense to reach that elevation in which we have all beheld him. Nor did you refuse the reward due to his merit; nay, it is owing to your liberality that he could apply so assiduously to those studies to which his taste led him. It was by your assistance he was enabled to collect, from various quarters, so many observations on plants, animals, and atmospherical phenomena, and to procure so many paintings, sculptures, books, and other records, which are in his library. All these he determined should be your property, for he knew that thus was the best prospect afforded of preserving them from the injuries of time. My husband placed all in your hands, not only that they might be preserved for the public benefit, but because he considered them as your property, even when he lived. For as his own means were found quite inadequate, you distinguished him above other citizens by every mark of favour, respect, and support, (*suppetiis;*) so that he seemed to owe you even more than he left. Having passed, however, his whole life in severe labour, under the shade of the Muses, or, rather, from his cradle, under your wings, he offered you his all—the fruit of his learning and industry, and consigned it to your care—the protectors of his country." Nor was this all that was done by the Senate. This august assem-

bly employed various eminent men to superintend the publication of his manuscripts. The names of Uterverus and Montalbani we have already mentioned; and Dempster, a Scotsman, and Ambrosinus, completed the vast undertaking. These illustrious Naturalists were liberally rewarded, and the whole expenses were defrayed from the public treasury; so proud was his country of her illustrious son.

And notwithstanding all, this is the dying pauper, miserably neglected, in the Public Hospital! We cannot believe it. We see no evidence for it; we see much against it. Sure there is enough of real tragedy in life to spare the necessity of our seeking it in the fictitious and the untrue. Our author was poor; but it was the voluntary poverty of a man who knew no other use of money than to supply the immediate exigencies of himself, and those dependant on him; who spent it faster than he could procure it, though it was for a noble end. He was poor, as it regarded this world's pelf; but he was rich—in the conviction that he had not lived and laboured for nought—in the interest he preserved in the productions of his hand and his head—in the admiration of the wise and the good of his own and of succeeding days. To his poverty was added blindness. Nor can we wonder, when we think of his great age and industry, "by night and by day, during summer and winter." From what we have seen, however, he would probably be

the last to repine at this dispensation; and upon the whole, we cannot but esteem and venerate him; indulging the hope that with his eye closed as to this world, he would elevate his inward vision from what had been his *summum bonum* on earth, to a higher and a better—from Nature's work to Nature's God; and surrounded by the cares, and kindnesses, and assiduities of a loving wife, of attached friends, and of an admiring country, would at least breathe his last in comfort and in peace.

In conclusion, we would remark, that in this slight sketch we have had no intention of presenting a mere *eloge*, although, from not entering into the details of our author's works, we have had more occasion to admire and commend than to criticise and blame. Undoubtedly, in our science, the labours of the learned were very different in the year 1538 from what they are in the year 1838. Much, very much, may accordingly be found in the writings of Aldrovandi which is now obsolete; and much which may be regarded as neither necessarily nor legitimately connected with the subject. Yet allowing all this, there is still a vast store of curious, accurate, and valuable information, and the Naturalist who would know the opinions of the ancients, and the origin of many modern ideas concerning his favourite science, will experience that he cannot refer to these volumes without finding much both of pleasure and of profit.

Aldrovandi's praises have been celebrated by

Barberini, afterwards Pope Urban VIII., in the following epigram:—

The various forms that swim the watery plains,
Whate'er the earth's capacious womb contains,
The trees and herbs that on her face appear,
And all the winged inhabitants of air,
In thy stupendous work collected lie,
To feast the soul, and strike the astonished eye.
Her own productions industry no more
Dares own, but wonders at the fruit she bore,
And faithful nature at thy deeds amazed,
Wishes her own those works thy art has raised.

INTRODUCTION.

THE British Islands, situated on the western coast of the European Continent, and enjoying a moderate temperature, are characterized by a vegetation of remarkable verdure and considerable luxuriance. Presenting every variety of surface, from the extended plain scarcely raised above the level of the sea, to the craggy mountain whose summit almost enters the region of perpetual congelation, and a great diversity of soil, from the sterile sand of the shores, or the spongy peat of the moors, to the richest loams of the most fertile valleys, they afford to quadrupeds and birds a diversity of food suited to their several natures, and, notwithstanding their isolated position, and the injurious interference of man, harbour a greater number of species than any tract of equal extent in corresponding continental latitudes. In a densely peopled country so circumscribed, the larger ferocious animals could not always maintain their footing; and thus, the Bear and the Wolf, which formerly found shelter in our forests, have long been extirpated. The Urus and the Wild Hog, useful as affording an occasional supply of food, have also disappeared, as has the Beaver, whose habits rendered it an easy prey. The Red Deer, the largest of our strictly terrestrial quadrupeds, would probably have shared the same fate, had it not been protected as subservient to the amusement of the great.

Of those which remain, fifty in number, none are of sufficient size or strength to be formidable to man in personal encounter; and those which are most injurious to him are generally the smaller and more prolific species, which he finds it impossible to extirpate, although he succeeds in reducing their numbers within moderate limits.

Of these fifty species one only is Alpine, namely, the White or Varying Hare, which inhabits the higher valleys of the Grampians, and other mountainous districts of the north. There are two species, however, which become white in winter, the Hare just mentioned, and the Ermine; the former remaining at that season at a considerable elevation, the latter occurring nearly at the level of the sea, as well as at great heights. All our Bats, fifteen in number, being purely insectivorous, become torpid in winter, when it would be impossible for them to find a sufficient supply of food. The Hedgehog, which is essentially insectivorous, although it also feeds on vegetable substances, also hybernates; as probably do the Shrews, at least in some degree. Of the other quadrupeds which pass the cold season in a state of inaction, one, the Badger, is omnivorous, and another, the Dormouse, frugivorous. The Squirrel, the Water-Rat, and perhaps some of the smaller Rodentia, appear also to undergo a degree of torpidity, varying in duration and intensity, according to the state of the temperature.

The Mammalia, excluding the Cetacea, may be disposed into nine orders or larger groups: Quadrumana or Monkeys, Cheiroptera or Bats, Insectivora, Carnivora, Marsupialia, Rodentia, Pachydermata, Ruminantia, and Solipeda. Of these orders, the Quadrumana, Marsupialia, Pachydermata, and Solipeda, are entirely wanting in the British Islands.

Of the Cheiroptera fifteen species have been described, all of which occur in the southern districts of England, while only three or four have hitherto been met with in Scotland. Of the six Insectivora, the Hedgehog occurs in all parts of England, and in many of the southern and middle districts of Scotland; the Mole is generally distributed in Britain, but is not seen in the Hebrides or in many parts of the Highlands; and the four Shrews are probably found in most parts of the country. There are twelve Carnivora, of which one, the Badger, has become very scarce, although it is met with in most of the counties; the Polecat, Ermine, Weasel, and Marten, are general; the Otter is found on the rivers as well as on the sea-shore; the Fox is general, and not very uncommon; the Wild Cat chiefly occurs in the woods and thickets of the north; of the four Seals one is common, the rest unfrequent; and the Walrus is an extremely rare and accidental visitant. Of the Rodentia, the most numerous order, there are fourteen species, of which one, the Irish Hare, is peculiar to Ireland; the Squirrel and Dormouse are plentiful in many parts of England; the Black Rat is nearly extirpated, the Brown Rat more extensively dispersed than any other British quadruped, excepting the Domestic Mouse; the Wood Mouse is general; the Harvest Mouse very rare in the north; the Water-Rat common in most parts, as is the Field Vole, and perhaps the Meadow or Red Vole; the Common Hare is general, while the Varying Hare is confined to the north, and the Rabbit is located here and there in most districts. Lastly, our two Ruminantia, the Red Deer and the Roe, are much more plentiful in Scotland than in England, where, indeed, the former scarcely exists in a truly wild state.

Of these animals few can be considered as directly useful to man, although, doubtless, all being subservient to some important purpose in the economy of nature, indirectly promote his interests. In an economical point of view, we may discard all the Cheiroptera and Insectivora; the terrestrial Carnivora rank as vermin; and the whole tribe of Rats and Mice would gladly be dispensed with. The Seals afford an occasional supply of oil, and their skins are useful for various purposes, and especially for covering trunks. The Rabbit and Common Hare are generally esteemed as articles of food, and their fur is used in the manufacture of hats, as is that of the Otter; the Deer, being now limited in number, and of more importance as subservient to the amusement of the wealthy, than as contributing to the general benefit. The Fox and the Hare are favourite objects of the chase. The most directly injurious to man are the Rats and Mice, which often commit great havoc among corn, stores, and articles of domestic consumption; the Mole, which by its excavations injures the pastures, lawns, and fields; and the Martens and Weasels, as well as the Fox, which sometimes destroy poultry and young lambs.

The following synoptical arrangement of the genera and species may be useful in enabling the student readily to discover the name of any quadruped which he may obtain.

SYNOPSIS OF BRITISH QUADRUPEDS.

I.—CHEIROPTERA.

MAMMIFEROUS animals having their anterior extremities extended, and connected with the posterior by a bare membrane, so as to enable them to fly. P. 69.

1. RHINOLOPHUS.

A thin complicated nasal membrane, of which the anterior part is curved in the form of a horse's shoe. P. 75.

1. *Rh. Ferrum-equinum.* Greater Horse-shoe Bat. Posterior nasal membrane ovate, and laterally expanded at the base. P. 78.

2. *Rh. Hipposideros.* Smaller Horse-shoe Bat. Posterior nasal membrane ovato-lanceolate, without lateral expansions. P. 81.

2. BARBASTELLUS.

Nasal groove lunate, without membranous appendage; forehead with a bare longitudinal line; ears large, broad, sub-quadrate. P. 76.

3. *B. Daubentonii.* Barbastelle Bat. P. 83.

3. PLECOTUS.

Nasal groove lunate, without membranous appendage; forehead flat, with a bare longitudinal line; ears very large, and elongated. P. 76.

4. *P. auritus.* Long-eared Bat. Ears more than twice the length of the head. P. 90.

4. VESPERTILIO.

Head round, forehead convex, face produced; wings and ears thin; eyes large, exposed. P. 76.

5. *V. mystacinus.* Whiskered Bat. Ears oblong, slightly sinuate on the outer margin, shorter than the head; tragus straight, tapering, half the length of the ear; fur reddish-black above, grey beneath. P. 90.

6. *V. Nattereri.* Reddish-grey Bat. Ears oblong-ovate, about the length of the head, their outer margin slightly sinuate; tragus straight, very narrow, tapering, nearly two-thirds of the length of the ear; fur reddish-grey above, whitish beneath; of a lighter colour than any other indigenous species. P. 92.

7. *V. Daubentonii.* Daubenton's Bat. Ears ovate, shorter than the head, their outer margin very slightly notched; tragus narrow, tapering, slightly curved, half the length of the ear; fur greyish-red above, ash-grey beneath. P. 94.

8. *V. emarginatus.* Notch-eared Bat. Ears ovate, nearly as long as the head, slightly curved outwards, their outer

margin with a deep sinus, beneath which is a rounded lobe; tragus subulate, more than half the length of the ear; fur light reddish-grey above, paler beneath. P. 96.

9. *V. myotis.* Mouse-coloured Bat. Ears ovate, as long as the head, with both margins involute at the base: tragus narrow, tapering, the inner margin straight, about half the length of the ear; fur reddish-brown above, greyish-white beneath. The largest British species: extent of wings fifteen inches. P. 99.

10. *V. Bechsteinii.* Bechstein's Bat. Ears ovate, spreading, somewhat longer than the head; tragus tapering, narrow, slightly curved outwards near the end, not half the length of the ear; fur reddish-grey above, greyish-white beneath. P. 101.

5. SCOTOPHILUS.

Head oblong, forehead flat, face tumid at the sides; wings and ears thick; eyes small, hid in the fur. P. 76.

11. *Sc. murinus.* Pipistrelle, or Common Bat. Ears ovato-triangular, shorter than the head, sinuate on the outer margin; tragus linear-oblong, slightly incurvate, concave in front, rounded at the end, half the length of the ear; fur reddish-brown above, paler beneath. P. 103.

12. *Sc. Serotinus.* Serotine Bat. Ears ovato-triangular, shorter than the head, directed obliquely outwards, slightly sinuate on the outer margin; tragus oblong, a third of the length of the ear; fur chestnut-brown above, yellowish-grey beneath. P. 108.

13. *Sc. Noctula.* Great Bat. Ears ovato-triangular, shorter than the head, the inner margin angular at the base, the outer arcuate; tragus elliptical, incurvate, with a broad rounded tip, less than a third of the length of the ear; fur short, reddish-brown all over, membranes dusky. Extent of wings fourteen inches. P. 110.

14. *Sc. Leisleri.* Hairy-armed Bat. Ears broadly ovate, shorter than the head, their inner margin angular at the base, the outer arcuate; tragus elliptical, incurvate, with the extremity rounded, a third of the length of the ear; a broad band of hair along the fore-arm beneath. P. 112.

15. *Sc. discolor.* Parti-coloured Bat. Ears ovate, rounded, short, bent outwards, their inner margin with a prominent lobe at the base; tragus elliptical, somewhat pointed,

a third of the length of the ear; fur chestnut-brown, tipped with white above, brownish-white beneath. P. 114.

II.—INSECTIVORA.

Incisors six or more in each jaw; grinders with angular points. P. 116.

6. ERINACEUS.

Upper part covered with spines. P. 118.

16. *E. Europæus.* Hedgehog. P. 118.

7. SOREX.

Very small quadrupeds, with conical head, attenuated snout, long and slender tail P. 121.

17. *S. araneus.* Common Shrew. Reddish-brown above, pale brownish-grey beneath; tail nearly cylindrical, with divergent hairs. P. 123.

18. *S. tetragonurus.* Square-tailed Shrew. Reddish-brown above, brownish-grey beneath; tail slightly attenuated at the tip, with closely appressed hairs. App. p. 308.

19. *S. fodiens.* Water Shrew. Blackish-brown above, white beneath; feet and tail ciliated with bristles. P. 126.

20. *S. remifer.* Oared Shrew. Black above, blackish-grey beneath; feet and tail ciliated with bristles. P. 130.

8. TALPA.

Head conical, snout attenuated, tail short, fore feet very large, and directed outwards.

21. *Talpa Europea.* Mole. P. 133.

III.—CARNIVORA.

Six incisors in each jaw; large canine teeth; grinders thin-edged or tubercular. P. 143.

9. MELES.

Body large, head small, limbs short and robust, tail short, hairs long and coarse. P. 114.

22. *Meles Taxus.* Badger. P. 148.

10. MUSTELA.

Body elongated, slender; feet short, tongue rough, tail of moderate length. P. 145.

23. *M. Putorius.* Polecat or Foumart. Fur long, dark-brown, yellowish at the base, lips and ears white. P. 152.

24. *M. Erminea.* Ermine or Stoat. Fur white in winter, brownish-red above in summer; terminal half of tail always black. P. 156.

25. *M. vulgaris.* Weasel. Fur brownish-red above at all seasons, tail of the same colour. P. 163.

11. Martes.

Body elongated, slender; feet short, tongue smooth, tail long and bushy. P. 145.

26. *M. Foina.* Marten. P. 166.

12. Lutra.

Body elongated, cylindrical; feet short webbed; tail long and tapering. P. 145.

27. *L. vulgaris.* Otter. P. 174.

13. Vulpes.

Grinders six above, seven below, on each side; tongue soft; claws not retractile; tail long and bushy. P. 146.

28. *V. vulgaris.* Fox. P. 182.

14. Felis.

Grinders four above, three below on each side; tongue rough; claws retractile; tail long and nearly cylindrical. P. 146.

29. *F. Catus.* Wild Cat. P. 188.

15. Phoca.

Body large, covered with short stiff hairs; tusks and incisors in both jaws; feet very short, webbed. P. 146.

30. *Ph. vitulina.* Common Seal. Grinders four-lobed, obliquely placed in the jaws. P. 199.

31. *Ph. grœnlandica.* Greenland Seal. Grinders three-lobed, directly placed in the jaws; fore feet with the second toe longest. P. 209.

32. *Ph. barbata.* Great Seal. Teeth very small, grinders three-lobed, direct; fore feet with the third toe longest. P. 212.

33. *Ph. Gryphus.* Grey Seal. Grinders conical, distant. P. 214.

16. TRICHECHUS.

Body large, covered with short stiff hairs; tusks and incisors wanting in lower jaw; feet very short, webbed. P. 147.

34. *T. Rosmarus.* Walrus or Sea Horse. P. 219.

IV.—RODENTIA.

Two incisors in each jaw. P. 225.

17. SCIURUS.

Grinders five above, four below; tail long, bushy, with the hairs directed laterally. P. 226.

35. *Sc. vulgaris.* Squirrel. P. 229.

18. MYOXUS.

Grinders four above, four below; tail long, slender, with the hairs directed laterally. P. 227.

36. *M. avellanarius.* Dormouse. P. 234.

19. MUS.

Grinders three above, three below; tail long, tapering, scaly, and nearly bare. P. 227.

37. *M. Rattus.* Black Rat. Greyish-black; tail longer than the head and body. P. 238.

38. *M. decumanus.* Brown Rat. Greyish-brown above, greyish-white beneath, ears a third of the length of the head; tail shorter than the head and body. P. 243.

39. *M. Musculus.* Domestic Mouse. Greyish-brown above, yellowish-grey beneath, ears half the length of the head; tail a little shorter than the head and body. P. 250.

40. *M. sylvaticus.* Wood Mouse. Reddish-brown above, greyish-white beneath, with a light reddish spot on the breast, ears scarcely half the length of the head. P. 254.

41. *M. messorius* Harvest Mouse. Light reddish-brown above, white beneath; ears one-third of the length of the head. P. 257.

20. ARVICOLA.

Grinders three above, three below; tail shorter than the body, round, scaly, but hairy.

42. *A. amphibius.* Water Vole. Tail about half the

length of the body and head; fur reddish-brown, dark-brown or black. P. 260.

43. *A. agrestis.* Brown or Field Vole. Tail one-third of the length of the head and body; fur reddish-brown above, yellowish-grey beneath. P. 266.

44. *A. pratensis.* Red or Meadow Vole. Tail half as long as the head and body; fur bright-red above, yellowish-white beneath. P. 271.

21. LEPUS.

Grinders six above, five below; two smaller teeth behind the incisors. P. 227.

45. *L. timidus.* Common Hare. Ears as long as the head; fur yellowish-brown, mixed with black, above; tail black above, white beneath. P. 274.

46. *L. Hibernicus.* Irish Hare. Ears shorter than the head; fur light brownish-red above; tail white. P. 279.

47. *L. variabilis.* White or Changing Hare. Ears one-third shorter than the head; fur white in winter; in summer dull greyish-black, intermixed with reddish. P. 282.

48. *L. Cuniculus.* Rabbit. Ears about a fourth shorter than the head; upper parts brownish-grey, mixed with yellowish-red. P. 286.

V.—RUMINANTIA.

No incisors in upper jaw. P. 291

22. CERVUS.

49. *C. Elaphus.* Red Deer. Horns with three anterior antlers. P. 296.

50. *C. Capreolus.* Roe Deer. Horns with one anterior antler, and a forked extremity. P. 304.

CHEIROPTEROUS ANIMALS,

OR

BATS.

A GREAT diversity of opinion has always existed respecting the arrangement of the Mammalia. Linnæus, in the last edition of his Systema Naturæ, published in his own lifetime, divided them into seven orders:—*Primates, Bruta, Feræ, Glires, Pecora, Belluæ*, and *Cete*. In the celebrated Prodromus Systematis Mammalium et Avium of Illiger, published in 1811, there are fourteen orders of Mammalia:—*Erecta, Pollicata, Salientia, Prensiculantia, Multungula, Solidungulc, Bisulca, Tardigrada, Effodientia, Reptantia, Volitantia, Falculata, Pinnipedia*, and *Natantia*. Blumenbach restricts the orders to nine:—*Bimanus, Quadrumana, Chiroptera, Digitata, Solidungula, Bisulca, Multungula, Palmata*, and *Cetacea*. In the Regne Animal of Cuvier, the Mammalia are disposed in nine orders:—*Bimana, Quadrumana, Carnivora,*

Marsupialia, *Glires*, *Edentata*, *Pachyderma*, *Ruminantia*, and *Cetacea*. Lastly, Mr Swainson, finding these and all other arrangements merely artificial, and, with a few other naturalists, convinced that the order of nature is circular and quinary, reduces the primary or ordinal divisions of the Mammalia to five:—*Quadrumana*, *Feræ*, *Cetacea*, *Glires*, and *Ungulata*.

The BATS, which form the subject of this article, occupy different positions in the systems of these authors. In that of Linnæus, they form the fourth genus of the order *Primates*, which includes Man, the Monkey tribe, and the Lemurs. They constitute, with the genus Galeopithecus, the eleventh order of Illiger's system, or the *Volitantia*. Blumenbach considers them as constituting an order by themselves, and names them *Cheiroptera*. Cuvier refers them to his third order, *Carnassiers* or *Carnivora*, of which, with the Galeopitheci, or Flying Lemurs, they form the first family, *Chéiroptères*, the other families being the *Insectivores* and the *Carnivores*. In the arrangement of Mr Swainson, they form the fourth family, *Vespertilionidæ*, of the order *Quadrumana*, or "Four-handed Quadrupeds," the other orders being the *Simiadæ*, or "Ape Monkeys," the *Cebidæ*, or American Monkeys, and the *Lemuridæ*, or Lemurs. Thus, Linnæus associates them with the Lemurs, Monkeys, and Man; Mr Swainson, with the same animals, man excepted, whom he discards from his system, because he has no "double affinity," there being no "class to which

we are related on the other side of the circle." Cuvier associates them directly with the Galeopitheci, and, secondarily, with the Hedgehogs, Shrews, Tigers, and Hyænas. These circumstances are mentioned here, that the reader may assign them a place according to his own pleasure. He may, however, for the present, without any compromise of principle, allow the writer to consider them, with Illiger, as a distinct order.

The CHEIROPTERA, or Mammalia of which the anterior extremities are so modified as to perform the office of wings (their name being derived from χειρ, the hand, and πτερον, a wing), are especially and more obviously characterised by having a lateral replication of the skin, extending from the neck to the tail, and including the fore and hind feet, of the former of which the first toe alone is left free, while the other toes, extremely elongated, constitute a kind of frame on which the membrane is stretched out. The apparatus thus formed serves to support them in the air, and even to enable them to perform a fluttering kind of flight, which, although much inferior in power and velocity to that of birds, is sufficient for the pursuit of the nocturnal Lepidopterous and Dipterous insects on which they prey, or for their passage from one tree or wood to another in quest of vegetable aliment. In conformity with this arrangement, they are furnished with strong clavicles and broad scapulæ, in order to give their shoulders the requisite firmness, while their fore-arm or cubitus is destitute of the rotatory motion so conspicuous

in that of Man and the Monkey tribe, but which would diminish the force of the impulse necessary for flight. Their thorax is proportionally wide, their sternum large, with a prominent crest or ridge, and their pectoral muscles well developed. Their hind feet are of moderate length, with the toes equal, and furnished with strong hooked claws, of which the toes of the fore feet are destitute, excepting the first, and sometimes also the second. Their abdomen is very narrow, so that the form of their body approaches to that of a Hawk or Owl; their tail short or of considerable length; their neck moderate or short; their head oblong or elongated. Their incisors vary in number; their canine teeth are generally large, and their grinders are furnished with tubercles, which are either sharp or blunt; so that no decisive general characters can be derived from their dentition. They have two pectoral mammæ, which, with the disposition of the other parts, indicate an affinity to the Quadrumanous animals. Their skin is covered with a soft fur, which is not generally extended over its lateral expansions, although sometimes their upper surface is more or less hairy. A similar disposition to expand in the dermal system is manifested in the ears, which are often very large, with curious appendages, with which the nose is also sometimes furnished. Their eyes are generally very small, in which respect they differ from many other nocturnal animals. But a compensating faculty exists in the extreme sensibility of the naked lateral membranes, by which they

are apprised of the proximity of objects, probably in consequence of a difference in the impulse given by the air; insomuch that a Bat, if deprived of its eyes, can find its way on wing, without coming into contact with cords or other impediments purposely arranged in a room. On the ground, the motions of these animals are exceedingly constrained. They are all nocturnal or crepuscular, roaming about in the dusk, or in cloudy weather, and reposing by day in caverns, crevices, and other concealed places, where they fasten themselves by their hind feet, hanging with their head downwards. But when resting for a short time, or climbing, they employ the hooked claws of the first toe of their fore feet. In cold climates, Bats undergo a partial torpidity, retiring for that purpose to holes or crevices in buildings, caves, or trees; but a moderate increase of temperature serves to arouse them, so that with us, they are sometimes seen abroad on a fine evening in the end of November or the beginning of February, and when discovered in their retreats in the midst of winter, they exhibit sensibility, or even emit a faint cry on being seized.

Without entering into a historical relation of the progress of discovery with regard to these animals, it will suffice here to refer the reader to Mr Gray's "Revision of the Genera of Bats," in the 12th number of the Magazine of Zoology and Botany, where he will find a succinct account of it. Mr Gray defines the Family of VESPERTILIONIDÆ as follows:

—"The limbs elongated; fingers of the forehands and tail enclosed in a nearly naked membrane, serving for wings; fingers very long; thumb free, clawed; toes of hind-feet short, equal, clawed; teeth variable." The numerous genera are disposed into five Tribes.

I. PHYLLOSTOMINA. Nose-leaf expanded into a leaf behind, simple, and pierced with the nostrils in front; ears lateral, separate.

Genera: *Rhinopoma, Arctibeus, Vampyrus, Phyllostoma, Carollia, Lophostoma, Edostoma, Macrophyllum, Brachyphylla, Diphylla, Stenoderma, Phyllophora, Glossophaga, Monophyllus, Anoura, Megaderma, Lavia, Mormoops.*

II. RHINOLOPHINA. Nose disk expanded into a leaf behind, and with a pit or process between the nostrils in front.

Genera: *Arteus, Rhinolophus, Hipposideros.*

III. VESPERTILIONINA. Nose simple. Grinders acutely tubercular; wings broad, large; tail elongated, as long as, and enclosed in, the large conical interfemoral membrane; upper cutting teeth near the canines, with a central space.

Genera: *Nycteris, Nyctophilus, Barbastellus, Plecotus, Romicia, Vespertilio, Furia, Natalus, Miniopterus, Scotophilus.*

IV. NOCTILIONINA. Nose simple. Grinders

acutely tubercular; wings long and narrow; body thin; tail thick.

Genera: *Taphozous, Noctilio, Proboscidea, Aello, Cheiromeles, Nyctinomus, Molossus, Thyroptera, Myopteris, Diclidunis.*

V. PTEROPINA. Nose simple. Grinders bluntly tubercular; nostrils slightly produced; end of index-finger clawed; head conical; ears simple, lateral; tragus none; wings long; lower joint of thumb long, united to the wing by a membrane; interfemoral membrane short; tail none, or short.

Genera: *Pteropus, Pynopterus, Epomophorus, Macroglossa; Harpyia, Cephalotes.*

The Bats which have hitherto been detected in Britain, fifteen in number, belong to the second and third of the above sections, namely, the *Rhinolophina* and *Vespertilionina*, and are named as follows:

Rhinolophina, with nasal membrane.

I. RHINOLOPHUS. Nasal membrane thin, extended into a transverse lanceolate leaf, with four cells at its base, and with a toothed longitudinal crest in the middle space, between the nostrils in front, and a slight pit in its front; ears large, separate; pubes with distinct false teats; tragus small.

1. *Rh. Ferrum-equinum.* Greater Horse-shoe Bat.
2. *Rh. Hipposideros.* Smaller Horse-shoe Bat.

Vespertilionina, without nasal membrane.

II. Barbastellus. Nasal groove simple, lunate, extending a short distance behind the nostrils; forehead flat, with an oval bald longitudinal line; ears large, broad, subquadrate; skull convex; face narrow.

1. *B. communis.* Common Barbastelle.

III. Plecotus. Nasal groove simple, lunate; forehead flat, with a linear bald streak; ears and tragus very large, elongated.

1. *P. auritus.* Common Long-eared Bat.

IV. Vespertilio. Head round; forehead convex; face small, produced, nearly covered with hair; wings and ears thin, membranaceous; body covered with woolly hairs; tail long, the whole length of the interfemoral membrane; $\frac{2 \cdot 2}{6}$ skull globular; jaws produced, narrow; eyes large, exposed.

1. *V. mystacinus.* Whiskered Bat.
2. *V. Nattereri.* Reddish-grey Bat.
3. *V. Daubentonii.* Daubenton's Bat.
4. *V. emarginatus.* Notch-eared Bat.
5. *V. myotis.* Mouse-coloured Bat.
6. *V. Bechsteinii.* Bechstein's Bat.

V. Scotophilus. Head oblong; forehead flat; face swollen on the sides, naked in front; wings and ears thick, rather coriaceous; body covered with short fine adpressed thick-set hairs; cutting

teeth $\frac{2 \cdot 2}{6}$; skull flat above; forehead shelving; eyes small, hid in the fur.

1. *Sc. murinus.* Pipistrelle, or Common Bat.
2. *Sc. serotinus.* Serotine Bat.
3. *Sc. Noctula.* Noctule Bat.
4. *Sc. Leisleri.* Hairy-armed, or Leisler's Bat.
5. *Sc. discolor.* Parti-coloured Bat.

Previous to the publication of Mr Jenyns's excellent Manual of British Vertebrate Animals, the student of this branch of Zoology had no connected descriptions of our Bats to which he could refer. The characters there given will be found generally satisfactory; and a more extended and equally correct account of these animals has since been presented to the public in Mr Bell's History of British Quadrupeds, which is illustrated by very beautiful engravings on wood. To both these works the author of this essay has been much indebted for information respecting several species with which he was not personally acquainted.

THE GREATER HORSE-SHOE BAT.

Rhinolophus Ferrum-equinum.—LEACH.

PLATE I.

Nasal membrane double; the anterior with its margins sinuated; the posterior laterally expanded at the base, and tapering to a point; the ears transversely grooved towards the outer margin.

Vespertilio Ferrum-equinum. Linn. Gmel. I. 50; Mont. Linn. Trans. IX. 122—Rhinolophus unihastatus. Geoffr. Ann. Mus. XX. 257; Desmar. Mammal. 125.—Rhinolophus Ferrum-equinum. Leach, Zool. Misc. III. 2; Jenyns, Brit. Vert. An. 19; Bell, Brit. Quadr. 68.

THE Rhinolophina are prominently distinguished by their nasal cutaneous appendage, which in the genus considered as typical of the family, is curiously complicated, and may be divided into two parts, an anterior and a posterior. The former, bearing a fancied resemblance to a horse-shoe, surrounds the nostrils, and stretches upward to the base of the posterior expansion, which is of an ovato-lanceolate form, or hastate, that is, furnished with lateral lobes. It has been conjectured that

THE GREATER HORSE-SHOE BAT.

this curious apparatus is intended for closing the nostrils when they are not in use, or that it forms an extension of the organ of smell; but it seems much more probable that the delicate and bare skin of which it consists, affords a peculiar localization to the sense of touch, doubtless rendered necessary by the habits of those animals, with which, however, we are not sufficiently acquainted to be enabled to connect their actions with their organization. Two species have been found in England, the Greater and the Smaller, very intimately allied in the form of all their parts.

The Greater Horse-shoe Bat has the head of an oblong form, the occiput rounded, the muzzle tumid, and margined with stiffish hairs. The mouth is wide; the upper incisors, two in number, are extremely small; the lower, which are four, three-lobed; six molares above, and the same number below. The nostrils are very small, placed near each other, in the bottom of a narrow cavity. The anterior membrane is somewhat in the form of a horse-shoe, anteriorly slit, with its margins sinuous; an erect oblong and pointed crest rises from its upper part; the posterior membrane is ovato-lanceolate, with a basal lobe on each side, and fringed with stiffish hairs. The ears are very large, ovato-acuminate, concave, slightly hairy, their outer margin transversely plicate, and having a sinus towards the tip; a large semi-orbicular lobe at the base is capable of closing the ear, when it is contracted. The fur, which is long and soft, is reddish-grey

above, pale-grey beneath; the lateral membranes dusky; the ears pale-brown. The entire length is three inches and nine lines, that of the head being eleven lines, of the body an inch and seven lines, of the tail an inch and a quarter; the alar expansion fourteen inches.

This species was first described by Daubenton, in 1759, in the Mémoires de l'Academie des Sciences, under the name of Le grand fer-à-cheval, or Great Horse-shoe Bat. Dr Latham was the first who found it in England, and by him it was communicated to Pennant. Montagu observed it, along with the smaller species, in the cavern called Kent's Hole, near Torquay; and it has been procured in various caverns in the south of England, as well as in Rochester and Bristol Cathedrals. Of its habits little more is known than that it retreats to the darkest parts of caves, deserted quarries, and buildings. The female is said to have commonly two young ones.

THE SMALLER HORSE-SHOE BAT.

Rhinolophus Hipposideros.—Leach.

Nasal membrane double; the anterior with its margin sinuated; the posterior ovato-lanceolate, without lateral expansions; the ears obsoletely grooved towards the outer margin.

Vespertilio Ferrum-equinum, B. Linn. Gmel. I. 50—Vespertilio minutus. Mont. Linn. Trans. IX. 163—Rhinolophus bihastatus, Geoffr. Ann. Mus. XX. 259; Desmar. Mammal. 125—Rhinolophus Hipposideros. Leach, Zool. Misc. III. 2; Jenyns, Brit. Vert. An. 20; Bell, Brit. Quadr. 73.

The Smaller so closely resembles the Greater Horse-shoe Bat, that many excellent observers, among others Daubenton and Kuhl, have considered it as not entitled to specific distinction. Geoffroy in France, and Montagu in England, appear to have been the first who traced the differences of the two species. By the former it was named *bihastatus*, and by the latter *minutus*, while Bechstein applied to it the name of *Hipposideros*, which is merely the specific appellation of the Greater Horse-shoe Bat translated into Greek, but which, although thus

manifestly objectionable, has been retained by later writers.

In its general form and proportions this species closely resembles the last; but is much smaller, and presents considerable differences in the ears and nasal appendages. Of the latter, the anterior membrane is broader and less deeply cleft anteriorly; the erect process less prominent; the posterior or frontal membrane is also broader, ovato-lanceolate, and destitute of lateral expansions. The ear is similar, but has the transverse ridges less prominent, and the sinus on the outer margin deeper. The fur is long and soft, the upper parts greyish-brown, the lower pale-grey, tinged with yellow; the alar membranes dusky. The entire length is two inches and a quarter, that of the head being eight lines, of the body one inch, of the tail eight lines; the alar expansion eight inches and a half.

In its haunts and habits this species resembles the former, with which it is usually found associated. It was first discovered in Wiltshire by Montagu, and has hitherto been observed only in a few places in the south of England.

THE BARBASTELLE BAT.

Barbastellus Daubentonii.—Bell.

Vespertilio Barbastellus, Gmel. Linn. I.; Mont. Linn. Trans. IX. 171; Geoffr. Ann. Mus. VIII. 196; Desm. Mammal. 145; Jenyns, Brit. Vert. An. 38.—Barbastellus Daubentonii. Bell, Brit. Quadr. 63.

The genus Barbastellus, instituted by Mr Gray, in the second volume of the Zoological Journal, is composed of a single species, which was first described by Daubenton in the Mémoires de l'Academie des Sciences, under the name of La Barbastelle. Desmarest states that it is not very common in France, and still less so in Germany, especially its northern parts. Mr Sowerby first detected it in England, and published an account of it in the British Miscellany; Montagu, in the ninth volume of the Transactions of the Linnæan Society, mentions two specimens obtained in Devonshire; Mr Jenyns states that it has been found in Northamptonshire and Cambridgeshire; and Mr Bell received a specimen from Kent.

The general aspect of this bat indicates a close affinity to the Plecoti or Long-eared Bats, with which, indeed, it has been arranged by Lesson. The muzzle is short and truncate; the nostrils are situated in a naked hollow which extends to the ears, and from which a groove passes on each side to the upper lip; the cheeks are tumid; the eyes very small; the ears are of a somewhat square form, about the length of the head, directed obliquely forwards, united at their base, with their inner margin turned back, their upper outline obliquely truncate, their outer margin with a sinus, from which five folds extend half way across; the tragus semicordate, acute, and half the length of the ear; the mouth small. The fur is long, very soft, on the head and back brownish-black, on the hind parts reddish-brown, on the lower surface dark-grey; the ears, alar membranes, and muzzle, black. According to Mr Bell, the teeth are $\frac{4}{6}$, $\frac{2}{2}$, $\frac{4}{4}$, $\frac{6}{6} = \frac{16}{18}$. In his specimen the length of the head and body was two inches, of the head seven lines, of the tail one inch nine lines, of the ears half an inch, the extent of the wings ten inches five lines.

PLATE 3.

THE LONG EARED BAT

LONG-EARED BAT.

Plecotus auritus.—GEOFFROY.

PLATE II.

Ears more than twice the length of the head; fur brownish-grey on the upper parts, paler beneath.

Vespertilio auritus, Linn. Syst. Nat. I. 47; Geoffr. Ann. Mus. VIII. 197; Desm. Mammal. 114; Jenyns, Brit. Vert. An. 27.—Plecotus auritus, Gray, Zool. Journ. II. 109; Bell, Brit. Quadr. 53.

THE genus Plecotus is readily distinguished by the extreme size of the ears, and these organs are of themselves sufficient to prevent one from confounding our only indigenous species with any other Bat that occurs in this country. But as it is more easily procured than many other species, I am induced to present a rather full description of it, that the student may have an opportunity of observing all the parts of a Bat by comparing them with that here given.

The body is depressed, short, and about the size of that of a Domestic Mouse. The head oblong; the eyes prominent, of ordinary size; the nostrils supernal, oblong, with a prominence at the anterior margin, which renders the snout a little emarginate, the ears very large, approximated at the base, where they are united by a membrane, elliptical and transversely rugous towards the outer edge, the internal margin flat, with two longitudinal converging lines. There are two small lobes at the base of the internal flat margin, and an anterior oblongo-lanceolate, rather obtuse, anteriorly concave membrane, with a small rounded process externally at the base; the mouth is large, opening to beneath the eyes. The fur is long, fine, and silky, of a dusky brownish-grey above, yellowish-grey beneath. The delicate membrane which includes the limbs and tail is of a dusky hue. The tail protrudes beyond the membrane about the eighth of an inch. The ears are dusky, and bare, but ciliated on the second rib, and on the inner margin towards the end. The anterior limb has four digits, the first very short, with three phalanges, and armed with a curved, compressed, acute claw; the second of two phalanges, the last being extremely small; the third and fourth of four; the fifth of five. The hind limb has four nearly equal, slender, short, compressed toes; the outer smaller, with two, the rest with three phalanges; all armed with acute, compressed, curved claws.

MUSEUM TESTIMONIAN

	Inch.	Lines.
Length from the mouth to the root of the tail,	1	9
Length of tail,	1	9
Greatest length of ear,	1	6
Extent of arms,	10	0
Humerus,	1	10
Cubitus,	1	4
Second finger,	1	3
Third finger,	2	6

The skull is oblong, with a short obtuse muzzle; the lower jaw has a narrow process at the angle directed obliquely backwards; there is a large vacuity in the occipital bone behind the foramen magnum and continuous with it. The cervical vertebræ seven, the posterior part of the five lower very narrow, without spinous processes; the dorsal vertebræ eleven; the lumbar seven, the sacral four, the caudal ten. The thorax is short and broad; the ribs eleven; the upper piece of the sternum is very broad, with a prominent central spine; the clavicle very long, slender, and curved, with the convexity anterior. The pelvis is very narrow. The scapula is diaphanous, with two obtuse spines, one projecting on each face; the coracoid process long and curved; the bones of the arm and hand very slender, the cubitus single; the carpal bones densely grouped; the metacarpal elongated. The hind legs comparatively short, the tarsus very small, the metatarsus very short, the feet capable of being turned nearly round inwards.

In the upper jaw are four incisors, the two middle

separated, bifid, acute; the two lateral acute, tapering, and shorter; two canine teeth, conical, acute, nearly straight; five grinders; the first small and conical, the second larger with a conical point, the last three nearly equal, with several small points. In the lower jaw the incisors are six; the canine teeth two, anterior to the upper, shorter, with an internal acute process; three anterior conical grinders on each side, three posterior grinders, each with three points.

The palate is transversely grooved, with seven curved furrows on each side. The tongue extensile, oblong, soft, rounded, thick, slightly convex above. The œsophagus seven twelfths of an inch long. The stomach very small, oblong, with large longitudinal prominent internal rugæ; the cardiac aperture about the middle, the pyloric large, without valve or contraction. The intestine is five and a half inches long, simple, nearly uniform in diameter. The fœces are black, and divided into fragments, like those of a mouse. The kidneys are oblong and compressed; the liver of moderate size, and lobed; the lungs rather large.

This Bat flies, like the Pipistrelle and other species, with a fluttering motion, but it possesses considerable agility, and turns with ease in every direction. It rises with facility from the ground, or even from the bottom of a box in which it may be kept. When it alights, it clings by the hooks of its fore limbs, and by its hind claws. In climbing, it moves the fore feet alternately, advancing slowly and in an awkward

manner, which is still more apparent when it crawls on a level surface. It adheres to the slightest asperities, and retires to the corners of the deserted apartments of old buildings, steeples, and the crevices of rocks, where it suspends itself by the hind feet, which are, as in other Bats, eminently adapted for the purpose, the claws being very acute and nearly of equal length. When springing off from a wall, it raises its fore legs first, stretches out its head, and erects its ears, which had been folded down, and it retains them erect when flying. When preparing for repose, it brings the fore feet close to the body, the cubital joint projecting and in contact with the knee, incurvates the tail, folds up the lateral membranes neatly, and brings the ears backwards, curving them along the side of the head and body, so as to resemble a ram's horn; the tragus or small anterior appendage projecting forward. Its voice is a low chirping squeak, and when teased or frightened it utters a querulous note like the wailing of a very young child.

This is one of the most common and most extensively distributed of our Bats, being found in most parts of England, and in many places in Scotland. Its winter retreats are the deserted chambers of decayed buildings, the interior of steeples or towers, and caverns, where it either clings to the surface, or thrusts itself into a hole or crevice.

Mr Jenyns has described a specimen found adhering to a willow in Grunty Fen in the Isle of Ely, as a distinct species, to which he gives the

name of *Plecotus brevimanus*. It differs somewhat in the proportions of its parts, and in its colours; but, as Mr Gray observes, it scarcely seems entitled to specific distinction. However, should other similar individuals occur, opportunities may be obtained of confirming Mr Jenyns' views, or of referring this alleged species to differences in age or sex.

WHISKERED BAT.

Vespertilio mystacinus.—LEISLER.

Ears oblong, slightly sinuate on the outer margin, shorter than the head; tragus straight, tapering, half the length of the ear; upper lip with long mystachial hairs; fur reddish-black above, grey beneath.

Vespertilio mystacinus, Leisler, Kuhl, Deutsch. Fledermm. Sp. 14; Desmar. Mammal. 140; Gray, Zool. Journ. II. 109; Jenyns, Brit. Vert. An. 26; Bell, Brit. Quadr. 50.

THE genus Vespertilio, as defined by Mr Gray, is composed of species which agree in having the head round, the forehead convex, the face small, produced, and nearly covered with hair; the eyes large; the ears thin, large, and membranous; the body covered with woolly hair; the wings large;

the tail long, with the interfemoral membrane extended to its extremity. Six bats belonging to it have been found in Britain.

Of these the Whiskered Bat, *Vespertilio mystacinus*, has the head small, the forehead rather flattened; the muzzle obtuse, but with a slight notch between the nostrils, which are tumid; the face very hairy, with a row of close-set hairs on the upper lip, forming a moustache, whence its name; a similar row across the forehead. The ears are shorter than the head, of an oblong form, rounded above, broad at the base, bending outwards, with the outer margin slightly sinuate; the tragus about half the length of the ear properly so called, straight, and tapering to a point. The thumb is of moderate size; the tail extended beyond the membrane about a line. The fur is long and woolly, on the upper part reddish-black, on the lower ash-grey. The ears and membranes are blackish. The whole length is three inches, of the head seven lines, of the tail an inch and a half; the extended wings measure eight inches and a half.

Of the habits of this species nothing is known beyond the fact of its retiring into houses, hollow trees, and caverns, in winter. Mr Jenyns states that it occurs, though rarely, in Cambridgeshire and Northamptonshire; Mr Yarrell has obtained it at Colchester, from the caverns under the castle; Mr Bell from the chalk cavern at Chiselhurst in Kent. It was discovered by Leisler in Germany, and was first noticed as British by Mr Gray.

REDDISH-GREY BAT.

Vespertilio Nattereri.—Kuhl.

Ears oblong-ovate, about the length of the head, their outer margin slightly sinuate; tragus very narrow, tapering, straight, nearly two-thirds of the length of the ear; margin of interfemoral membrane crenate, and fringed with stiff hairs towards the end; fur reddish-grey above, whitish beneath.

Vespertilio Nattereri, Kuhl, Deutschl. Flederm. Sp. 3; Desmar. Mammal. 135; Jenyns, Brit. Vert. An. 21; Bell, Brit. Quadr. 42.

The Reddish-Grey Bat, so named by Mr Bell, on account of its prevailing colour, has the head rather small; the muzzle narrow, projecting, slightly emarginate; the nostrils oval. The ears are of a narrow ovate form, as long as the head, their tip obtuse, and their outer margin scarcely sinuate; the tragus very narrow, lanceolate, and bare. The lateral membranes are bare, and of a reddish-grey colour; the margin of their interfemoral portion fringed with short stiff hairs. The fur is long, soft, and light reddish-grey above, silvery-grey beneath;

the ears yellowish-grey. The entire length is three inches and seven lines; that of the head eight lines, of the tail an inch and three-fourths; the extended wings measure eleven inches.

This Bat, which is of a lighter colour than any other of our indigenous species, is stated by Mr Jenyns to occur in hollow trees at Swaffham in Cambridgeshire, and to have been received by Mr Yarrell from Colchester and Norwich. Mr Bell had three individuals from Chiselhurst in Kent, which were found in a chalk cavern at the bottom of a shaft seventy feet deep, in company with *Barbastellus*, *Vespertilio mystacinus*, and *Plecotus auritus*.

DAUBENTON'S BAT.

Vespertilio Daubentonii.—Leisler.

PLATE III.

Ears ovate, shorter than the head, with their outer margin very slightly notched; tragus narrow, tapering, slightly curved, somewhat obtuse, half the length of the ear; tail longer than the body.

Vespertilio Daubentonii, Leisler, Kuhl; Deut. Flederm. Sp. 11; Desmar. Mammal. 141.—Vespertilio emarginatus, Jenyns, Brit. Vert. An. 26.

According to Mr Bell, who states, that after a careful examination of several specimens of the species described by Mr Jenyns as *Vespertilio emarginatus*, he has been convinced of its identity with *V. Daubentonii* of Kuhl and Desmarest, this species has the head rather small, the forehead somewhat elevated, the top of the head flattened; the muzzle obtuse, with numerous long stiffish hairs, and a mystachial series of soft long hairs on either side of the upper lip, which is tumid from sebaceous follicles; the ears about three-fourths of the length of the head, ovate, bending a little

THE REDDISH GREY BAT

outwards, their outer margin very slightly emarginate; the tragus narrow, tapering to a rather obtuse point, curved a little inwards, and half as long as the ear; the tail a little shorter than the fore-arm, and extended about a twelfth of an inch beyond the membrane. The fur is long, soft, greyish-red above, ash-grey beneath; the membranes are dusky, with a reddish tinge, the interfemoral whitish beneath. The length of the head and body two inches; of the head seven lines, of the tail an inch and a half; extent of wings nine inches.

This species, which is common in various parts of Germany, has been found by Mr Jenyns at Milton Park in Northamptonshire, and by Mr Yarrell at Islington. It is also stated to have been found by Dr Fleming in Fifeshire.

The individual from which the accompanying figure has been taken was found in Dumfries-shire by Sir William Jardine, and referred by him to the present species.

NOTCH-EARED BAT.

Vespertilio emarginatus.—Geoffroy.

Ears ovate, obtuse, nearly as long as the head, slightly curved outwards, their outer margin with a deep sinus, beneath which is a rounded lobe; tragus subulate, more than half the length of the ear; fur light reddish-grey above, paler beneath, approaching to white.

Vespertilio emarginatus, Geoffr. Ann. du Mus. VIII. 198; Desmar. Mammal. 140; Bell, Brit. Quadr. 45.

I have been fortunate in procuring a specimen of this very rare species from a gentleman who obtained it at Winchester. The species was first found at Abbeville by M. Baillon, and by Mr Geoffroy in the excavations at Charlemont. The latter, in describing it, states that he received a specimen from M. A. Brongniart, who found it in the neighbourhood of Dover. As the imperfect descriptions of Messrs Geoffroy and Desmarest afford the only account of the species hitherto published, the following, taken from an English specimen, may be considered as not unimportant.

The head is ovate, but including the fur roundish, with the forehead slightly elevated; the muzzle of moderate length, and slightly emarginate between the nostrils, which are ovate and lateral. The ears are nearly as long as the head, widely separated, ovate, obtuse, bent outwards; their inner margin convex, the outer with a semicircular lobe at the base, and a wide and deep sinus in their upper half. Viewed without reference to the basal lobe, they might be described as oblong, but otherwise they are broadly ovate, and deeply emarginate. There are five transverse plicæ running from the outer margin, and the inner has a marginal narrow curved cartilage. The wings are long and of moderate breadth; the cubitus a little longer than the tail; the membranes bare, the thumb of two joints, the second finger of two, the third of three, the fourth of four, and the fifth of three. The tail is long, and extends half-a-twelfth of an inch beyond the interfemoral membrane, which has eighteen transverse plaits. The feet are long; the toes equal, excepting the outer, which is a little shorter; their claws small, curved, compressed, and tapering to a very fine point.

The ears, which are bare, unless at the base, are of a dusky tint; as are the lateral membranes, of which the plicæ are brown, excepting those of the interfemoral portion, which, with the very long spur, are whitish beneath. The fur is long, close, and very soft, inclining to silky. There is a series of long soft mystachial hairs on each side of the upper jaw, and a few project from the chin. The general

colour of the fur is a very light reddish-brown inclining to grey on the upper parts, and greyish-white tinged with brown on the lower; but the basal portion of the fur above and beneath is dark-brown.

	Inch.	Lines.
Entire length,	3	3
Length of head,	0	7½
Length of head and body,	1	11
Length of tail,	1	4
Length of ears along the inner margin,	0	5
Ears along the outer margin,	0	7
Extent of the wings,	9	6
Humerus,	0	9½
Cubitus,	1	5½
Pollex,	0	2
Its claw,	0	1
Second finger,	1	4½
Third finger,	2	3
Fourth finger,	1	10½
Fifth finger,	1	9½
Thigh bone,	0	6
Leg,	0	7½

Of the peculiar habits of this Bat nothing is known. Its dentition is stated to be $\frac{4}{6}, \frac{2}{2}$; $\frac{6}{6}, \frac{6}{6} = \frac{18}{20}$. In its general appearance, it approaches nearly to *V. pipistrellus*, from which it differs, however, in having the tragus more slender, that part being in fact narrower than in any British Bat, and in the proportions of the parts, as may be seen on comparing the descriptions. Unquestionably the two species belong to the same genus, but having adopted Mr Gray's arrangement, I shall adhere to it.

MOUSE-COLOURED BAT.

Vespertilio myotis.—KUHL.

Ears ovate, narrowly rounded, as long as the head, with both margins involute at the base.; tragus narrow, tapering, the inner margin straight, about half the length of the ear; fur reddish-brown above, greyish-white beneath.

Vespertilio murinus, Geoffr. Ann. Mus. VIII. 191; Desmar. Mammal. 134; Jenyns, Brit. Vert. An. 20; Bell, Brit. Quadr. 37.—Vespertilio myotis, Bechst. and Kuhl, Deut. Flederm. Sp. 4.

THIS species, which is common on many parts of the continent, is very rare in Britain, the only specimens, according to Mr. Jenyns, that are known to have been obtained, having been found in the gardens of the British Museum. It is the largest of our native species, but nothing is known of its habits in this country. On the continent, it is said to inhabit old buildings, and the towers of churches, where it is often met with in hundreds. They do not associate with others, and are extremely quarrelsome among themselves. Desmarest's description is as follows:—

The face is almost entirely bare, having only a few scattered hairs; the forehead very hairy; the nose smooth, projecting beyond the lower lip; the nostrils open laterally, with prominent margins; the upper lip is pendent on each side, with the commissure a little raised; the eyes rather large, surmounted by some blackish hairs; the ears much inclined backwards, with the point directed forwards, bare, of an ash-grey colour on their outer surface, tinged with yellow on the inner, their margins simple and somewhat hairy; the tragus falciform, with the outer margin terminated by a small smooth lobe; the mouth large; the teeth very acute; six grinders on each side in both jaws; the tongue having a scabrous protuberance at its base. The lower part of the body is of a soiled white, inclining to yellowish; the hind head and back reddish-brown, as in Bechstein's Bat, the hairs being of a brownish-black at the base; the membranes brownish; the colour of the upper parts of the body, around the membrane of the wings, darker in proportion to the age of the animal.

The measurements as given by Mr Jenyns are:—Length of the head and body three inches five lines; of the head eleven lines; of the tail one inch eight lines; of the ears eleven lines and a half; of the tragus five lines; of the thumb five lines; extent of wing fifteen inches.

BECHSTEIN'S BAT.

Vespertilio Bechsteinii.—LEISLER.

Ears ovate, spreading, rounded at the tip, somewhat longer than the head; tragus tapering, narrow, slightly curved outwards near the end, not half of the length of the ear; fur reddish-grey above, greyish-white beneath.

Vespertilio Bechsteinii, Leisler, Kuhl, Deut. Flederm. Sp. 2; Desmar. Mammal. 135; Jenyns, Brit. Vert. An. 21; Bell, Brit. Quadr. 40.

THIS species, which is said to reside on the continent, only in hollow trees in woods, and never in buildings, is very rare in Britain, the only specimens obtained having been taken by Mr Millard in the New Forest. According to Desmarest, it never mingles with other species, and the largest flock observed was composed of thirteen females. The same author remarks that it differs from Natterer's Bat, especially in having no crenatures on the margin of the interfemoral membrane; and Mr Bell, borrowing from Desmarest, observes that it may be distinguished from *Vespertilio murinus*, to which also it bears a general resemblance, by the

87651

larger size of the ears, the different proportions of the wings, which, although as broad, are shorter, as well as by the darker tint of the membrane and the lighter colour of the belly. Not having had an opportunity of examining this species, I refer to Desmarest's description, which has in a great measure evidently been copied by Messrs Jenyns and Bell.

The face is almost bare, being sprinkled with small stiff hairs; the muzzle long and conical; the nose rather narrow, and somewhat depressed in the middle; the ears longer than the head, rounded at the end, thin and transparent; the tragus sickle-shaped, a little curved outwards near the end; the eyes small, and black; the mouth wide, extending to the ears, the commissure of the lips situated behind the angle of the eye; six grinders above and below on each side. The fur reddish-grey or yellowish-grey above, and whitish-grey beneath; all the hairs dark-brown at the base. According to Mr Jenyns, the length of the head and body is two inches one line; of the head nine lines; of the tail one inch three lines; of the ears ten lines; of the tragus four lines; the extent of wing eleven inches.

VESPERTILIO PIPISTRELLUS.

COMMON BAT, OR PIPISTRELLE.

Scotophilus Murinus.—Gray.

Ears ovato-triangular, shorter than the head, sinuate on the outer margin; tragus about half the length of the ear, linear-oblong, slightly incurvate, rounded at the end, and concave in front; fur reddish-brown above, paler beneath.

Vespertilio murinus, Linn. Sys. Nat. I. 47;—Vespertilio Pipistrellus, Geoffr. Ann. Mus. d'Hist. Nat. VIII. 195; Desmar. Mammal. 139; Jenyns, Brit. Vert. An. 24; Bell, Brit. Quadr. 23. Common Bat, Penn. Brit. Zool. 184.

The genus Scotophilus is characterised by having the head oblong, the forehead flat, the face tumid on the sides, and bare in front; the membranes of the ears and sides thick and somewhat leathery; the body covered with rather short, thick-set, adpressed fine hairs; the cutting teeth four above and six below; the eyes small, and scarcely apparent, being concealed among the fur. Five of our British Bats are referred to it. Of these the most common is the Pipistrelle, which appears to be generally distributed.

The Reverend Leonard Jenyns, in an elaborate paper in the 16th volume of the Transactions of the Linnæan Society, first satisfactorily showed that the common Bat of this country is the *Pipistrelle* of Daubenton, Buffon, and other Continental authors, and not their *Chauve-souris*, or *Vespertilio murinus*, which, so far from being common with us, is one of the rarest of our species. The following description is drawn up from specimens obtained in Scotland, where it is very abundant.

The head is oblong, convex behind, flattened before; the muzzle short, and obtuse; the eyes extremely small, and with difficulty perceptible among the hair; the nostrils terminal, opening anteriorly by a rounded aperture surrounded by a thickened margin, which has a slit in the outer and upper part, the space between them slightly concave; the mouth opening to beneath the eyes; the upper lip thick, with a deep longitudinal sulcus behind. The ears are shorter than the head, directed obliquely outwards and forwards, of an irregular ovato-triangular or semicordate form, obtuse, the inner margin with a rounded lobe at the base, and two prominent lines, the outer sinuate above the middle, with two very small tubercles near the base, and four distinct transverse rugæ on the upper part; the tragus oblong, rounded, curved inwards, and concave anteriorly. The body is short, depressed, anteriorly broad; the neck short and thick. The anterior limb or wing has the pollex extremely

short, with three joints, its claw very small, compressed, and slightly curved; the second finger of two joints, the last extremely small; the third of four; the fourth and fifth of three each. The hind feet are rather long, slender, with five very small, compressed, nearly equal toes, the claws decurved, tapering, much compressed, and very acute. The tail is rather long, very slender, and terminates in an obtuse point projecting slightly beyond the membrane.

The fur is fine, soft, or somewhat silky, and rather long; of a deep brown or dark reddish-brown colour above, lighter beneath; the ears and membrane dusky. In some individuals the fur is of a light reddish-brown, or even dull yellowish-red. Over the eye is a small prominence, bearing a tuft of longish hairs, two of which are longer and bristly; and the space about the eye is usually rather bare.

The teeth are: four incisors above, six beneath, the latter three-lobed; two canine teeth above, two below, and ten grinders in each jaw. The œsophagus is three quarters of an inch in length; the stomach oblong; the intestine four inches long, of nearly equal diameter in its whole length; the anus with four valvular tubercles. The kidneys are large and flattened; and in autumn there is an immense accumulation of fat between the skin and muscles over the whole body, but more especially on the flanks, and towards the posterior extremity. The following are the dimensions of two adult individuals:—

	Inch.	Lines.	Inch.	Lines.
Length to root of tail	2	0	1	9
Tail	1	6	1	2
Total length	3	6	2	11
Head	0	9	0	7
Extent of wings	8	3	8	2
Ear from outer base	0	6	0	6
Humerus	0	6	0	8
Cubitus	1	3	1	3
Third finger	3	3	3	2
Pollex and claw	0	2¾	0	3

From the middle of spring, but earlier or later according to the warmth of the season, to the middle of October, sometimes commencing as early as March, and continuing till November, this Bat may be seen after sunset, in the neighbourhood of towns and villages, over the streets of cities or the roads, in the alleys and lanes, or along the course of brooks and rivers, fluttering with an unsteady motion, and apparently undetermined course. Its flight is not rapid, like that of a bird, but rather resembles that of a large moth or butterfly. It turns and winds in all directions, flying at various heights from ten to twenty or more feet, and sometimes as high as the tops of the trees, but more commonly at an elevation of about fifteen feet. It is attracted by a white handkerchief, or any other body, thrown up in the air, for which reason boys are fond of tossing their caps at it. Sometimes it has been caught upon the fly-hooks of a fishing-rod hung over a bridge. It continues its flight until dark, and probably during the night, especially in summer, as well as in the morn-

ing twilight; and reposes through the day in the corners and crevices of old buildings, towers, and steeples. As its food consists entirely of insects; and especially the nocturnal Lepidoptera, it is forced by the increasing cold of winter to relinquish its pursuits, and betake itself to some secure retreat in a ruined building or cavern, where it remains until the returning heat arouses it from its torpor. In this state it is found suspended by its hind feet in chimneys, crevices, or corners, or jammed into a hole or fissure. A frequent place of retirement is under the roofs of houses, and especially of churches; but it presents great variety in its selection; and I have obtained specimens from the hollow of a decayed tree near Duddingston.

The Pipistrelle rises with facility from a flat surface, is capable of advancing on the ground with considerable celerity, and ascends a vertical plane, provided it be somewhat rough, without much difficulty. In confinement, it feeds on flies and raw meat.

A specimen, in the British Museum, said to exhibit all the characters of a young individual, has been described by Dr Leach, in the first volume of the Zoological Journal, as a distinct species, under the name of *Vespertilio pygmæus*.

SEROTINE BAT.

Scotophilus Serotinus.—Gray.

Ears ovato-triangular, shorter than the head, directed obliquely outwards, their outer margin slightly sinuate towards the end; tragus oblong, little more than a third of the length of the ear; fur chestnut-brown above, yellowish-grey beneath.

Vespertilio Serotinus, Gmel. Syst. Nat.; Desmar. Mammal. 137; Jenyns, Brit. Vert. An. 22; Bell, Brit. Quadr. 34.—Vespertilio Noctula, Geoffr. Ann. Mus. VIII. 193.

The Serotine Bat, which was discovered by Daubenton, is said to be common in France, Germany, and Holland, frequenting forests, piles of wood, and sometimes houses, and appearing at a later period than the other species. With us it has hitherto been found only in the vicinity of London. According to Desmarest, it seems to be of an unsocial disposition, flying singly or in pairs, and has only one young one at a birth, which it produces towards the end of May. Its characters, as given by that author, are the following:—

The face is nearly bare; the upper lip very tumid, furnished with tubercles whence issue some hairs; the muzzle short, broad, thick, and tumid; the nose a line and a half in breadth anteriorly; the nostrils rounded; the forehead very hairy; the eyes small; the ears ovate, triangular, having their inner margin much arched, their extremity blunt and bent outwards, the external surface hairy for half its extent, the rest bare; the tragus elongated and semicordate; four grinders on each side in the upper jaw, and five in the lower; the head extending four lines beyond the carpus, when the wings are folded. In the male the fur is deep chestnut, passing beneath into yellowish-grey, which contrasts strongly with the blackish-brown colour of the wings and interfemoral membrane. The hair on the back is long, glossy, and silky. The females differ from the old males more than in any other species, the colours of the fur being much paler. Young individuals have the colours darker. The length of the head and body is two inches nine lines, of the tail two inches; and the extended wings measure from twelve to fourteen inches.

NOCTULE, OR GREAT BAT.

Scotophilus Noctula.—Gray.

Ears ovato-triangular, shorter than the head, their inner margin angular at the base, the outer arcuate; tragus less than a third of the length of the ear, elliptical, incurvate, with a broad rounded tip; fur short, reddish-brown all over, membranes dusky.

Vespertilio Noctula, Desmar. Mammal. 136; Jenyns, Brit. Vert. An. 23; Bell, Brit. Quadr. 12.—La Serotine, Geoffr. Ann. Mus. VIII. 194.

The Great Bat of Pennant is, as its name implies, one of the largest of our British species, being exceeded only by *Vespertilio myotis*. It was first described by Daubenton, in the Memoirs of the French Academy for 1759, and introduced to notice as an inhabitant of this country by White, in his Natural History of Selborne. Its habits are social, and numerous individuals have been found together in its winter retreats, so many as a hundred and eighty-five having been taken in one night from under the eaves of Queen's College, Cambridge, and sixty-

three the next night. According to the observations of authors, it comes abroad earlier in the evening than any other species, so that the name Noctule is peculiarly inapplicable, has a remarkably high and rapid flight, emits a sharp and harsh cry when on wing, and inhabits churches, buildings of various kinds, and sometimes hollow trees. It is later in leaving its winter retreat than our other species, not appearing until the end of April, and withdraws early in autumn. In summer it flies in bands of about a dozen individuals, and is seldom met with single. Like many other species, it emits an offensive odour, which comes from the sebaceous glands near the commissure of its lips.

The head is large, broadly ovate, and flattened; the muzzle short and broad; the nose slightly emarginate, the nostrils oblong, lateral, with a thickened margin, and a slit behind; the mouth wide; the eyes very small, and situated close to the base of the ears; which are placed wide apart, and present an irregular oval form, their inner margin angularly lobate near the base, the outer arched, repand, and extending to the base of the lower jaw; the tragus less than a third of the length of the ear, arcuate, narrow at the base, with a broad rounded tip. The tail is longer than the cubitus, and protrudes about a line beyond the membrane, which has about fifteen transverse folds. There are four incisors above, six below, two canine teeth in each jaw, and five grinders on each side above and below.

The fur is of moderate length, close, and soft;

its colour of a uniform reddish-brown, scarcely paler on the lower parts. That of the membrane is dusky.

	Inch.	Lines.
Length of the head and body	3	0
Length of the head	0	11
Length of the tail	1	9
Length of the ear along the outer margin	0	10
Tragus	0	3
Fore-arm	2	1
Pollex and claw	0	4
Extent of wings	14	0

HAIRY-ARMED BAT.

Scotophilus Leisleri.—Gray.

Ears broadly ovate, shorter than the head, their inner margin angular at the base, the outer arcuate; tragus a third of the length of the ear, incurved, with the extremity rounded; a broad band of hair along the fore-arm beneath; fur long, bright chestnut above, brownish-grey on the lower parts.

Vespertilio Leisleri, Kuhl, Deutsch. Flederm. Sp. 6; Desmar. Mammal. 138; Jenyns, Brit. Vert. An. 23; Bell, Brit. Quadr. 18.

This species, which obtained from its discoverer Leisler the name of *dasycarpos*, but to which Kuhl

subsequently gave as a specific appellation that of the Naturalist who first distinguished it, can scarcely claim a place in our Fauna, since only a single specimen, of doubtful origin, in the British Museum, is all that has hitherto been seen of it.

It is described by Desmarest as having the head short and flat; the nose broad, the nostrils crescent-shaped, the lips tumid, the forehead very hairy; the eyes small, and concealed by the fur; the commissures of the lips having each above it a large white gland; the ears very hairy within; the mouth not extending to the ears; the teeth very pointed. One of its principal distinctive characters consists of a band of hairs, nearly half an inch broad, proceeding from the neck, and extending over the lower part of the wing as far as the carpal joint. The membranes are brownish black; the part of that of the wing which is contiguous with the abdomen is covered beneath with very large hairs; the pollex short and slender. The fur on the upper parts is bright chestnut, its basal portion dark brown, on the lower parts brownish-grey at the end, but blackish-brown at the base.

The dimensions of the specimen in the British Museum, as given by Mr Bell, are as follows:—

	Inch.	Lines.
Length of the head and body	2	6
Length of the head	0	9
Length of the tail	1	8
Length of the ears	0	5

	Inch.	Lines.
Breadth of the ears	0	4
Length of the tragus	0	1½
Extent of the wings	11	3

It is said by Desmarest to resort to hollow trees in large bands, in which individuals of other species are never met with; and to prefer the vicinity of stagnant water.

PARTI-COLOURED BAT.

Scotophilus discolor.—Gray.

Ears ovate, rounded, short, bent outwards, with a prominent lobe on the inner margin; tragus nearly as broad above as below, somewhat pointed, one-third of the length of the ear; fur of the upper parts chestnut brow with white tips, of the lower brownish white.

Vespertilio discolor, Natterer; Kuhl, Deutsch. Flederm. Sp. 8; Desmar. Mammal. 139; Jenyns, Brit. Vert. An. 24; Bell, Brit. Quadr. 21.

This species, of which a specimen, taken at Plymouth by Dr Leach, and now in the British

Museum, is the only one hitherto found in Britain, is said to occur in houses, but not in hollow trees, and to come abroad early in the evening. It was discovered in the south of Germany by Dr Natterer, and is considered by him as the most beautiful of the European Bats, on account of the variegated appearance of its upper parts, which are of a rich chestnut dotted with white. The length of the head and body is two inches and a half, of the tail an inch and a half, of the ears six lines, that of the head being ten, the extent of the wings ten inches and a half. The forehead is very hairy; the muzzle broad, long, and tumid; the nose thick and very broad; the lips very tumid, the upper furnished with small hairs; the eyes very small; the ears rounded, ovate, bent outwards, and extending to the angle of the mouth with a very distinct rounded lobe on the inner margin near the head, their lower half covered with thick woolly hair.

The preceding descriptions of our British Bats, although necessarily brief, will, it is hoped, suffice to enable one to refer an individual which he may obtain to its proper species, or to shew him that it is rare, or perhaps new. And as hitherto comparatively little attention has been paid to the subject, it may not be amiss here to recommend to the reader who may have opportunities of obtaining Bats, to examine them carefully, and record all the facts, whether of structure or of habits, that may come under his observation.

INSECTIVOROUS QUADRUPEDS.

In the arrangement of animals adopted by Cuvier, the third order of the Mammalia, named by him *Carnassiers*, and the same in part as the *Feræ* of Linnæus, is divided into five families, namely, the *Cheiropteres*, which we have already considered apart; the *Insectivores*, which feed chiefly on worms and insects; and the *Carnivores*, which prey on quadrupeds, birds, and other animals. Leaving to our readers to decide whether the Carnivorous Mammalia ought to constitute an order by themselves, or be associated with the Insectivorous, we proceed to offer a few remarks relative to the latter.

In the form and disposition of their teeth, they resemble the Bats, and, like them, feed principally on insects, many of them coming abroad at night only, and some residing entirely under ground. Some of them have large incisors in front, those at the sides and the canine teeth being smaller, while in others the canine teeth are large, and the incisors small. Among the former are the Hedgehogs and Shrews, while the Mole belongs to the latter. There is little accordance in their general form, some being

robust, while others are slender; or in their exterior, which sometimes presents strong prickles, sometimes the softest velvety fur; but they are all plantigrade, or in walking apply the entire sole to the ground, and are furnished with clavicles. Their mammæ are abdominal, and they produce several young at a time.

This group may be divided into three families—the *Erinaceidæ*, or Hedgehogs; the *Soricidæ*, or Shrews; and the *Talpidæ*, or Moles; of the first and last of which there is one representative in Britain, and of the other three.

THE HEDGEHOG.

Erinaceus Europæus.—Linn.

PLATE V.

Ears short; prickles of moderate length,

Erinaceus Europæus, Linn. Syst. Nat. I. 75; Desmar. Mammal 147; Jen. Brit. Vert. An. 19; Bell, Brit. Quadr. 76.

The Hedgehogs are characterized as a genus by having six incisors in each jaw, the middle ones very long; the body covered with spines instead of hair; the tail very short; and all the feet furnished with five toes. Only a single species occurs in this country. It is a small animal, measuring about ten inches in length, with a conical muzzle, an oblong body, convex above; the feet so short as almost to allow the abdomen to touch the ground; the ears very short, broad, and rounded; the eyes of moderate size; the upper parts and sides covered with sharp prickles; the face and lower parts with stiff and woolly hairs. There are thirty-six teeth;

THE HEDGEHOG

the central incisors long and stout, the lateral small, as are the canine teeth, which have two roots. In the upper jaw are seven, and in the lower, four grinders, on each side. The spines are cylindrical, hollow, marked externally by rings, internally by transverse dissepiments; they are attenuated at the base, and at the distal extremity taper to a fine point; their lower half is pale horn-colour, the rest dark-brown, excepting the tip, which is pale and transparent. The stiff hairs of the lower parts are yellowish-grey, the woolly brownish-grey. The claws are rather long, moderately curved, and much compressed. The female has six mammæ on each side, the first anterior to the axilla, and the last inguinal.

The convex back, conical muzzle, and short tail of this animal, suggesting an analogy to the domestic pig, have obtained for it the names of Urchin and Hedgehog. During the day it reposes in its retreat, generally under the roots of an old tree, or on a hedge-bank, or in the crevice of a rock or wall, and at night comes abroad in search of its food, which consists for the most part of insects, snails, slugs, and worms, as well as reptiles. But it also eats the roots of various herbaceous plants, fruits, and especially apples that have fallen from the trees, and is said to destroy eggs, occasionally even entering hen-houses for the purpose; and, in short, has some title to be considered as omnivorous, like its more illustrious namesake. Although its motions are too slow to enable it to escape from an

active enemy, and its power of inflicting injury slight, it is furnished with the means of defending itself against the aggression of more powerful animals; for in cases of emergency it contracts itself, and spreads out its spinous covering, so as to present a uniformly impervious surface. In this state it may be rolled or kicked about without receiving injury, and very few of the best terriers will venture to attack it, at least effectively.

Sometimes it is introduced into gardens, where it is useful by destroying the slugs and worms; and in the kitchens of many of the houses in London, as related by Mr Bell, it is kept for the purpose of devouring the cock-roaches by which they are infested. It is easily domesticated, and in captivity feeds on bread, vegetables, flesh, and such other substances as are usually given to dogs or cats.

In the end of autumn, the Hedgehog, without laying up any store for the winter, betakes itself to its nest, which is composed of leaves of trees, dry grass, and moss, rolls itself up into a ball, and falling into a state of torpidity, so remains until the middle of spring. Early in the summer the young are produced; they are generally three or four, and are born blind. As to the absurd fables told by Aristotle, Pliny, Buffon, and others, respecting this animal, which has been alleged to carry off fruits on its prickles, and to injure the udders of cattle by sucking their teats at night, it is time to give up any allusion to them.

The Hedgehog is generally distributed in the

cultivated, parts of England, and in the southern and part of the middle divisions of Scotland; but is not found in the northern districts of the latter country, nor in the western or northern islands.

THE SHREWS.

THE diminutive quadrupeds known by the name of Shrews, or Shrew-mice, are characterized by having the body moderately full, the head conical, with the snout attenuated, the tail long and slender; the feet short with five toes, the claws of moderate length, compressed, curved, and acute. They are also readily distinguishable by the peculiar form and arrangement of their teeth, of which there are, generally, four jagged molares in the upper, and three in the lower jaw, on each side, while the other teeth, or those in the anterior part of the mouth, are four or five in the upper, and three in the lower jaw. These anterior teeth have been variously represented by authors, some considering them as incisors, others as incisors and false molares. The front pair, considerably distant at their base, although approximating towards the end, are large, lobed, directed forwards at the base, but curved

towards the end, and are generally taken for the middle incisors. Those on each side, in either jaw, intervening between these lobed anterior teeth, generally conical, simple, and diminishing in size backwards, are held to be lateral incisors. However this may be, the Shrews may at once be distinguished from other small British quadrupeds by their peculiar and remarkable dentition. The Reverend Mr Jenyns, to whose researches among the vertebrate animals we are so much indebted, has published, in the second volume of the Magazine of Zoology and Botany, some very interesting observations on these animals, which are as yet by no means satisfactorily described. He is of opinion that our *Sorex araneus* and *S. fodiens* are not identical with the animals bearing the same names on the Continent, and that, probably, several other species may be found in this country; but as the subject is still involved in obscurity, it may be judged sufficient here to describe the three which are known, leaving with them the names that have been generally applied to them by British writers.

THE COMMON SHREW.

THE COMMON SHREW.

Sorex araneus.—Auct.

PLATE VI.

Reddish-brown above, pale brownish-grey beneath; tail and feet not ciliated; teeth ten above, six below, on each side, lower anterior tooth four-lobed.

Sorex araneus. Jen. Brit. Vert. An. 17; Bell, Brit. Quadr. 109.

The Common Shrew varies in size and colour, and is, probably, confounded with one or more species hitherto undetermined. Its length, including the tail, is about four inches and a half; its body moderately full; the neck short; the head tapering to a pointed snout; the ears very short and rounded; the fore-feet small, with five slender toes; the hind-feet larger, with the five toes destitute of lateral bristles, or ciliæ beneath, which are observed in the aquatic species; the claws of all curved, compressed, acute, and of moderate length; the tail shorter than

the body, somewhat four-sided, of nearly equal thickness throughout. The fur is short, fine, and soft; the mystacial bristles very long; the tail covered all round with short stiffish hairs. The upper parts are brownish-red, the lower pale brownish-grey; the feet flesh-coloured, with whitish hairs; the eyes black; the teeth tinged with brownish-red. The length of the head of an individual is one inch and a twelfth, of the body one inch and eight-twelfths, of the head and body two inches and nine-twelfths, while that of the tail is an inch and ten-twelfths.

This species, which is generally distributed in England and Scotland, residing in woods, hedges, and fields, chiefly in dry situations, although occasionally met with in meadows and moist pastures, feeds entirely on insects and worms, in searching for which it works its way along the surface, concealed among the grass and herbage. Although its feet are well adapted for running, they are equally so for digging; and, accordingly, it passes the winter in burrows, to which it retreats when in danger, and it forms superficial runs or galleries among the grass. But even with this hideling kind of life it is not secure from the attacks of enemies, being frequently seized by the Kestrel, and Owls of different kinds, especially the Barn Owl, in the stomachs of which the bones of the head are often found uninjured. Its cry is a shrill and feeble cheep; it runs with great celerity, and emits a rank musky smell, in consequence of which, as is supposed, cats,

although they kill, will not eat it. A foolish notion is prevalent among country-people, that should a Shrew run over the leg of a cow or horse while reposing among the grass, it causes lameness, and for this reason it is invariably killed when an opportunity occurs; whereas, being perfectly harmless, and living exclusively on insects, it rather merits protection. It forms a bulky nest of grass, covering it above, and placing it either in a sheltered place on the surface, among thick herbage, or in a hole in a bank; and the number of its young varies from five to seven. In summer an annual mortality takes place among them, and they are then frequently found dead in the woods without any external appearance of injury. If equally impatient of hunger with the Mole, perhaps it may be caused by drought, which destroys the worms in the places frequented by them, and induces the insects to betake themselves to moister localities. They are extremely pugnacious, and Mr Bell states, that if two "be confined in a box together, a very short time elapses before the weaker is killed and partly devoured." When at rest, this species, like the others, keeps its body much contracted, the spine being greatly arched, so that it appears extremely short, with the head disproportionately large.

THE WATER SHREW.

Sorex fodiens.—Auct.

Blackish-brown above, silvery white beneath, the colours abruptly defined; feet and tail ciliated with bristles; teeth eight above, six below on each side; lower anterior tooth two-lobed.

Sorex fodiens, Jen. Brit. Vert. An. 18; Bell, Brit. Quadr. 115. S. Daubentonii, Desmar. Mammal. 150.

The Water Shrew is larger than the species already described, and easily distinguished from it by the darker colour of its upper parts, separated by an abruptly defined line from the pure or greyish-white of the lower surface. Its length, including the tail, is nearly five inches and a half; its form similar to that of the Common Shrew, but more elongated; and its tail about two-thirds of the length of that of the head and body together, or rather longer than the latter. The snout is considerably flattened; the ears very short, rounded, with three lobes internally,

one of which is margined with white hairs, forming a speck of that colour among the dusky fur; the tail slender, somewhat quadrangular, a little compressed at the end, and fringed beneath with bristly white hairs. The feet are proportionally broader than those of the preceding species, and the toes are laterally margined with white shining bristly hairs. The fur is soft, and of a velvety or silky texture; the colour on the upper parts greyish-black, brownish-black, or very dark-brown, but sometimes reddish-brown, on the lower a silvery or greyish-white; the large incisors are reddish-brown at the end.

This species, which has been observed in various parts of England and Scotland, resides in burrows, on the margins of ponds, brooks, and ditches, and appears to be as aquatic in its habits as the Water-Rat, which has its residence in similar situations. But, unlike that animal, it feeds entirely on insects and worms, in search of which it makes excursions upon the water, and dives with ease to the bottom. In swimming, it presents a singular appearance, its sides being apparently expanded, its body lying so lightly as to be two-thirds out of the water, its tail extended along the surface, and it paddles away seemingly with little effort, scarcely causing a ripple, although its speed is considerable. I have seen it sporting as it were on the water, several individuals swimming about in various directions, sometimes shooting along in curves at an accelerated rate. It is a very timorous animal, and on the least apprehension of danger, dives and gets close

to the bank, or swims directly to its hole. Having been found at a considerable distance from water, it is supposed to seek its food occasionally on land. The number of its young is said to be six or eight. The female is somewhat smaller, and of a lighter tint on the upper parts. The length of an individual, of which the sex was not determined, is five inches and a quarter, the head and body measuring three inches and a quarter, the tail two inches.

The following very interesting account of its habits is given by Mr Dovaston, in the second volume of the Magazine of Natural History. "On a delicious evening, far in April, 1825, a little before sunset, strolling in my orchard, beside a pool, and looking into the clear water for insects I expected about that time to come out, I was surprised by seeing what I momentarily imagined to be a Dytiscus marginalis, or some very large beetle, dart with rapid motion, and suddenly disappear. Laying myself down cautiously and motionless on the grass, I soon, to my delight and wonder, observed it was a mouse. I repeatedly marked it glide from the bank, under water, and bury itself in the mass of leaves at the bottom: I mean the leaves that had fallen off the trees in autumn, and which lay very thick over the mud. It very shortly returned, and entered the bank, occasionally putting its long sharp nose out of the water, and paddling close to the edge. This it repeated at very frequent intervals, from place to place, seldom going more than two yards from the side, and always returning in about

half a minute. I presume it sought and obtained some insect or food among the rubbish and leaves, and retired to consume it. Sometimes it would run a little on the surface, and sometimes timidly and hastily come ashore, but with the greatest caution, and instantly plunge in again. During the whole sweet spring of that fine year, I constantly visited my new acquaintance. When under water he looks grey, on account of the pearly cluster of minute air-bubbles that adhere to his fur, and bespangle him all over. He swims very rapidly; and, though he appears to *dart*, his very nimble wriggle is clearly discernible."

THE OARED SHREW.

Sorex remifer.—GEOFFROY.

PLATE VII.

Black above, blackish-grey beneath, the colours blended on the sides; feet and tail ciliated with bristles; teeth eight above, six below on each side; lower anterior tooth two-lobed.

Sorex remifer, Geoffr. Ann. Mus. XVII. p. 182; Desmar. Mammal. 152; Jen. Brit. Vert. An. 18; Bell, Brit. Quadr. 119.

THE Oared Shrew differs from the species last described, in being larger, more robust, with a less attenuated snout, and a darker colour, the lower parts being blackish instead of white. The length, including the tail, is five inches and a quarter. The feet are proportionally stronger than those of the other species, and distinctly ciliated with strong dusky hairs, as is the tail beneath. That organ is quadrangular at the base, and compressed toward the end. The colour of the upper parts is brownish-black; that of the lower dusky-grey, or blackish

SOREX REMIFER.

anteriorly, tinged with brown; the throat and fore-neck brownish-grey; the feet and tail dusky; the tips of the large incisors reddish-brown.

Although nothing is known from observation of the habits of this species, the structure of its feet and tail would lead us to infer that they are similar to those of the Water Shrew. It was first found in Norfolk by Dr Hooker, and described under the name of *Sorex ciliatus* by Mr Sowerby. Since then individuals have been obtained in Cambridge-shire, Battersea-fields, and near Glasgow, in which latter locality three were found by Dr Scoular. It may here be observed, however, that a specimen in the Museum of the University of Edinburgh, said to be from the neighbourhood of Glasgow, and I believe presented by Dr Scoular, as *Sorex remifer*, is of the preceding species, with which it agrees perfectly in size and colour.

This species has a white spot on the ear, like the last. It differs considerably in tint, and the long hairs on the lower surface of the tail are sometimes whitish. It is considerably larger than *S. fodiens;* the head and body measuring three inches and a half in length, the tail two inches and two lines.

An animal of this genus, described by Dr Fleming in the second volume of the Transactions of the Wernerian Society, under the name of *Sorex fodiens*, or Water Shrew, appears to be distinct from any of the above. The length of the head

and body was three inches, of the tail two. "Above black; beneath grey; snout long, and a little compressed; whiskers long; eyes small, concealed in the fur, with a small white spot above each; ears likewise minute, with a paler tuft on the inside; in the middle of the throat, a black spot; a narrow stripe of black along the belly; at the base of the tail, a triangular black spot; inside of the feet and legs white; the outer side black, connected with the back; tail pointed, covered with very short hair, with a crest or ridge on the under side, of paler coloured hair. The species chiefly frequents fields of clover and strong oats. It is by no means rare in the county of Fife." This is obviously more allied to the *Sorex fodiens* than to the other species, but is very probably different from any of those described. A more minute examination, and a comparison of individuals with those of the Water Shrew and Oared Shrew, are, however, necessary to settle the question.

The wood-cut below is copied from Mr Jenyns's figure of the teeth of the Common Shrew.

Stewart del.

Lizars sc.

THE COMMON MOLE.

THE COMMON MOLE.

Talpa Europæa.—Linn.

PLATE VIII.

Fur velvety, black; eyelids open; incisors equal in length.

Talpa Europæa, Linn. Syst. Nat. I. 73; Desmar. Mammal. 160; Jenyns, Brit. Vert. An. 17; Bell, Brit. Quadr. 85.

The Moles, of which only a single species occurs in Britain, are small quadrupeds, having the body nearly of a cylindrical form, the neck very short and thick; the head tapering to a pointed snout; the fore limbs very short and strong; the fore feet of great breadth, furnished with remarkably strong straight claws; the soles directed outwards; the hind feet small, with slender claws; the eyes extremely small, and concealed among the fur; the ears destitute of auricles; the tail short and slender; the hair soft and velvety. There are six incisors in the upper, and eight in the lower jaw; large, triangular, compressed, canine teeth; seven grinders above, and six below, in each jaw. In their form

and structure these animals are intelligibly adapted to their peculiar mode of life; their short, exceedingly strong anterior limbs, broad and firm feet, and powerful claws; their pointed muzzle, of which the extremity, or nose, is possessed of great mobility; and the cylindrical form of their body, enabling them to make their way under ground with unrivalled facility.

The species which is found in Britain may be described as follows:—The body is rather long, nearly cylindrical, rounded behind; the neck extremely short, so that the head seems immersed between the shoulders; the snout elongated and depressed, with a groove along its upper and lower surfaces, its extremity narrow but abrupt; the nostrils terminal and approximate; the eye minute, in the centre of a bare space about the twelfth of an inch in diameter, the eyelids opening to a very small extent; the external ears obsolete. The limbs are very short; the anterior feet extremely broad, with the palm directed outwards or backwards; five toes, with an internal rudimentary toe or appendage, consisting of a single bone, and apparently serving to broaden the part for digging; the first and fifth toes nearly equal, the third longest, the fourth next, the second slightly shorter than the fourth; the upper surface almost destitute of hairs, the lower bare and wrinkled; the claws straight, depressed, thin, and rounded at the end, a little concave beneath, and having at the base a fixed sheath. On the hind feet, which are rather small,

and of the ordinary form, are five toes, with an internal rudimentary toe or appendage; the claws a little curved, slightly bent inwards, compressed, tapering to a point, and grooved beneath; the sole bare and rugose, the upper part slightly hairy. The fur or pile is uniform, consisting of under-fur, there being no strong hairs, unless on the tail, and a few short bristles on the snout. The general colour is blackish-grey, viewed against the pile brownish-black, along the pile bluish-grey and glossy; the lower parts paler, especially the abdomen; the lower jaw reddish-brown; the fore neck and fore part of the shoulders slightly tinged with the same colour; the eyes blackish-grey; the snout flesh-coloured, as are the bare parts of the feet, as well as the claws.

The upper incisors, six in number, are nearly of equal length, but the middle pair are much broader; the lower, eight, slope forwards, and are also nearly of equal length. The upper canine teeth are very large, a little curved, and much compressed; the lower short, less compressed, and directed obliquely outwards. The first three upper grinders are small compressed, and pointed; the other four are large; the first compressed, conical, and acute; the second with two large, and three small points; the third with three outer small points, two larger middle, and an inner; the fourth small, of a triangular form, with five short points. The lower jaw is very narrow, with the teeth slanting outwards; there are in it also three anterior small.

compressed, conical grinders; the first large grinder has four points; the second five; the last also five. The tongue is long, worm-like, depressed, and thin-edged at the end. The palate is marked with large transverse ridges. The intestinal canal, from the mouth to the extremity, measures six feet; the stomach is large and membranous; the intestine of uniform diameter.

If it be added to these particulars, that the snout is furnished with a small bone at its extremity; that the cervical ligament is exceedingly strong; the clavicles large; the bones of the anterior extremity nearly as thick as long; the sternum large, with a longitudinal ridge; the pectoral muscles, and those of the arm, fore arm, and hand, extremely developed, and we shall be enabled to perceive the adaptation of the form and structure of the Mole to its peculiar habits.

To an animal destined to live under ground, an acute sense of sight could be of no advantage, and therefore the vision of the Mole seems to be confined to the mere perception of light, by which it is apprised of its approach to the surface. But, on the other hand, its hearing, although it has no external ear to collect the vibrations of the air, is considered as extremely delicate. Its instantaneous perception of movements in the air or ground, however, may be as satisfactorily accounted for by according it an extreme delicacy of organization in the general organ of touch or sensibility, such as exists in the Bats.

The food of the Mole consists especially of earth-worms, *Lumbricus terrestris*, in quest of which it burrows its way in the soil, extending its subterranean excursions in proportion as its prey diminishes in number; but the excessive and unremitting labour required in this pursuit, were it carried on at random, is rendered unnecessary by an instinct which impels it to excavate a series of runs or galleries, along which it can walk without inconvenience, and from different points of which it proceeds, forcing its way into the hitherto unperforated soil. In forming its subterranean paths, it works with its fore feet, which, as has been seen, are admirably adapted for scraping away the earth, and throwing it backwards, propelling itself forward by its hind feet, which are disposed in the usual manner. When it has thus excavated an extended series of walks, it can run along them to any point without difficulty, and finds security in them from the pursuit of many enemies, although man employs them as a sure means for entrapping it. For our knowledge of the methodical arrangement of these passages, we are chiefly indebted to the labours of M. Henri le Court, who devoted a great part of his life to the examination of the habits of the Mole. According to his observations, as recorded by Geoffroy St Hilaire, each individual appropriates to himself a district, or space of ground, in which he forms a kind of fortress under a hillock raised in some secure place, as beneath a bank, or near the roots of a tree. In this eminence, of

which the earth is rendered very compact, is formed a circular gallery, communicating with a smaller gallery placed above it by several passages. On the level of the lower, or larger gallery, is a roundish cavity or chamber, communicating with the upper by three passages. From the outer gallery branch off a number of passages, which run out to a variable extent, and, forming an irregular curve, terminate in what may be called the high-road, which is a long passage proceeding from the outer circular gallery, and at the same time communicating directly with the central cavity. It extends to the farthest limit of the domain, is of somewhat greater diameter than the body of the animal, has its walls comparatively compact, and communicates with the numerous passages by which the domain is intersected. By this principal passage the Mole visits the various parts of its hunting-ground, burrowing to either side, and throwing out the earth here and there so as to form heaps or mole-hills. As it traverses this path several times daily, it is in it that snares are laid for its capture. The excavations vary in their distance from the surface according to the nature of the soil and other circumstances. In deep rich earth they are sometimes nearly a foot in depth, while in gravelly or clayey ground, covered with a thin layer of soil, they are often scarcely an inch. Often, also, the Mole burrows quite close to the surface of rich loose soil which has been ploughed, and sometimes runs along it, forming merely a groove or trench. The principal object of

its pursuit is the earth-worm, but it also feeds on larvæ, and is said occasionally to devour frogs, lizards, and even birds. Its voracity is excessive, insomuch that hunger urges it to exhibit a kind of fury, and it is found to perish in a very short period if deprived of food. It is said to drink frequently also, and to form passages to brooks or ponds in the vicinity of its residence. During winter, when the cold forces the worms deeper into the ground, it follows them to their retreats, driving its galleries and alleys to a corresponding depth.

But although thus doomed to a life of incessant labour, its peculiar organization renders its occupations not more painful to it than are those of the Woodpecker, which one might, without due consideration, imagine to be incompatible with enjoyment. Doubtless, however, the greatest pleasure that an animal can enjoy, is in the free and full exercise of its faculties; and that the Mole is not overtasked is proved by its general vigour and high condition. During winter it retires at intervals to its fortress, in which it has formed a bed of dry leaves or grass, to enjoy a profound repose; but in spring it quits this habitation, and rests during the warm season in a mole-hill.

On the surface, to which it sometimes makes its way, it can run with considerable speed, but, if not in the immediate vicinity of its hole, is easily overtaken. It is more especially in the early part of the day that it is thus occasionally met with. When a meadow which it has frequented has been inun-

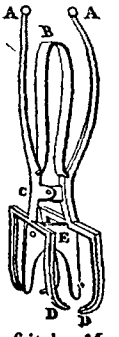
dated, it has been seen to swim with great vigour; and instances are known of its making its way to islands in lakes and rivers.

The males are more numerous than the females, and the former sometimes engage in desperate combats. The number of young produced at a birth varies from three to seven, and the period of parturition is from April to the end of summer; but whether more than one litter is produced in the year has not been ascertained. The nest is generally found beneath a large mole-hill, and is formed of a mass of leaves, grass, fibrous roots, and other vegetable substances.

When a young Mole accidentally comes to the surface, it runs about as if lost, and is unable to make its way into the ground. One which I obtained in the middle of June ran with its body considerably raised, its tail elevated, its fore feet touching the ground only by the inner two claws, the palms directed backwards, its head close to the surface. It endeavoured to insinuate itself into any cavity or crevice that came in its way, and buried its head among the thick grass and roots of shrubs. It evidently could not see, for it ran directly against objects, and in its haste often tumbled over on its back, but quickly regained its proper position.

By destroying vast quantities of worms and grubs, the Mole may be considered as conferring a benefit on the agriculturist; and by perforating the soil, and throwing up the earth, it has been by some alleged to improve the natural pastures, especially

in hilly districts; but in the cultivated grounds, and particularly in gardens and nurseries, the injury which it inflicts, by its incessant labours, is more obvious than any benefit that is derived from them, and, in fact, is often very great; for which reason, it is everywhere an object of persecution, and vast numbers are annually destroyed by means of a kind of springe, generally formed of a twig fixed into the ground by one end, and bent, so that the other touches the surface, while there is appended to it a loop of cord, fastened to another, enclosed in a tube of wood or iron, introduced into a run or gallery, the animal, in passing through which, displaces the peg, by which the end of the twig is kept down, and the latter springing up, carries with it the Mole suspended and strangled by the cord.



Another still more efficient trap is represented by the accompanying wood-cut. Between the two handles, A, A, which move on a joint, C, is placed a strong spring, B. The incurved and serrated prongs, D, D, are kept apart by a plate, E, on displacing which, the animal is caught by the spring's violently forcing the prongs against it.

A vast deal has been said as to the benefits conferred by this animal, and the injuries inflicted by it; but after all, it appears to me that the following account of it by M. Valmont-Bomare is as correct as those of the most recent date. "Woods, vineyards, gardens, pastures,

and cultivated fields, becoming successively the place of its abode, are also the theatre of its ravages. As active as stealthy, says M. de la Faille, it continually shifts its domicile from one place to another, overcoming every obstacle, such as walls, ditches, and canals; and to avoid perishing in the midst of the waters, or wasting its strength on entrenchments, which often intercept its passage, it knows, by a wonderful industry, to lead its galleries at a very great depth under rivers and broad foundations. Should it meet with an insurmountable impediment, it, like an expert engineer, examines the ways, and explores the ground, winds round rocks or hills, and employs all the resources of its instinct to open up a path. But it is a destructive enemy that never marches without spreading desolation wherever it passes." Man is its principal and most destructive enemy; but it appears that it is occasionally preyed upon by rapacious animals and birds, especially Foxes, the Buzzard, and Owls.

The Mole is said not to occur in any part of Ireland, or in Orkney or Shetland. It is not met with in any of the Hebrides, excepting Bute, and is unknown in many of the northern and western districts of the Highlands, but is distributed over all the other parts of Britain, from the level of the sea to the height, in some places, of a thousand feet or more, although it is more abundant in the lower and richer grounds. It exhibits several varieties as to colour, being met with of a silvery grey, bluish-grey, cream-colour, dull orange, and sometimes white, or pied.

CARNIVOROUS QUADRUPEDS.

THE Carnivora, which may be considered as analogous to the Raptores among birds, form the third family of the Carnassiers in the arrangement adopted by Cuvier; the first family being composed of the insectivorous and frugivorous Cheiroptera, the second of the Insectivora properly so called, both of which have already been passed under review. The animals which now come to be described subsist chiefly on the flesh of quadrupeds and birds, or on fish, to procure which they are generally endowed with great agility, an excitable temperament, and a disposition to employ stratagem when open force is insufficient. Their molar teeth are not terminated by sharp conical prominences, like those of the Moles, Shrews, and other insectivorous species; nor are they flattened, like those of animals that feed exclusively on vegetable substances; but are thin-edged, and more adapted for cutting than bruising; their canine teeth are very large, and between them are generally six incisors in each jaw. Some species are, however, less essentially carnivorous than others, and may be distinguished by a peculiarity

in the form of the teeth, which are furnished with blunted tubercles. According to characters derived from these instruments of mastication, together with the form of the feet, this family or order may be divided into three groups, named *Plantigrada*, *Digitigrada*, and *Amphibia*.

I. PLANTIGRADA.—The Plantigrade Carnivora, so named on account of their applying the entire naked sole of the hind foot to the ground when walking, have five toes on all the feet. Their molares are furnished with blunt tubercles, and their colon is destitute of cœcum. Their motions are generally slow; they roam abroad chiefly at night, feed on vegetable as well as animal substances; and when confined to cold countries, pass the winter in a state of torpidity. To this family belong the Bears, Badgers, Racoons, Benturongs, and Coatis. In this country there is now only a single species, of which the genus may be defined as follows:—

1. MELES. BADGER.—Second incisor of the lower jaw placed behind the rest; grinders five above, six below, on each side, in a continuous series; body large; head small and rather elongated; limbs short and robust; claws of the fore feet long; tail short, with a glandular pouch beneath its base, whence exudes a fetid humour; hair long and coarse.

1. *Meles Taxus*.—Common Badger.

II. DIGITIGRADA.—The Digitigrade Carnivora, on the contrary, walk on their toes only, their tarsi being raised and covered with hair all around. Their grinders are thin-edged, although variously lobed; their colon destitute of cæcum. They are essentially carnivorous, slender, extremely agile, cunning and ferocious. This group may be divided into several sections, such as the *Mustelina*, including the Martens, Weasels, and Otters; the *Canina*, composed of the Wolves, Foxes, and Hyænas; the *Felina*, of which the Lions, Tigers, Lynxes and Cats, are representatives. Species of the following genera occur in Britain.

MUSTELA. WEASEL.—Grinders four above, and five below, on each side; body elongated, slender; feet short; toes not webbed; claws acute; tongue rough.

1. *M. Putorius.*—Polecat or Foumart.
2. *M. Erminea.*—Ermine or Stoat.
3. *M. vulgaris.*—Common Weasel.

II. MARTES. MARTEN.—Grinders five above, and six below, on each side; body elongated, slender; feet short; toes not webbed; claws acute; tongue smooth.

1. *M. Foina.*—Common Marten, including the Beech and Pine Martens of authors.

III. LUTRA. OTTER.—Grinders five above, and five or six below, on each side; body elongated,

cylindrical; feet short, webbed; tail long, tapering, a little flattened.

1. L. VULGARIS.—Common Otter.

IV. VULPES. FOX.—Grinders six above, seven below, on each side; pupil elliptical; tongue soft; ears large, pointed; body compressed; tail long and bushy; claws not retractile.

1. *Vulpes vulgaris.*—Common Fox.

V. FELIS. CAT.—Grinders four above, three below, on each side; tongue rough, with horny papillæ directed backwards; ears moderate; tail long and nearly cylindrical; claws retractile.

1. *Felis Catus.*—Wild Cat.

III. AMPHIBIA.—The Amphibious Carnivora have the limbs very short, the feet broad, with the toes connected by the skin, so as to convert them into instruments of natation. They are moreover characterized by the shortness and stiffness of their hair. The teeth are various. They seek their food, consisting of fish, in the water, swim and dive with ease, and are capable of continuing long beneath the surface; but they return to the land to repose, and there also they bring forth and suckle their young. Two genera may be considered as British.

1. PHOCA. SEAL.—Tusks and incisors in both jaws; grinders uniform, generally three-lobed.

1. *Ph. vitulina.*—Common Seal.
2. *Ph. grœnlandica.*—Greenland Seal.
3. *Ph. barbata.*—Great Seal.
4. *Ph. Gryphus.*—Grey Seal.

II. TRICHECHUS. WALRUS.—Tusks and incisors wanting in the lower jaw; tusks in the upper extremely large and directed downwards; grinders short and truncated.

1. *T. Rosmarus.*—Walrus.

THE BADGER.

Meles Taxus.—Fleming.

PLATE IX.

Grey above, brownish-black beneath; head white, with a longitudinal black band on each side.

Ursus Meles. Linn. Syst. Nat. I. 70.—Meles vulgaris, Desmar. Mammal. 173.—Meles Taxus, Jen. Brit. Vert. An. 10; Bell, Brit. Quadr. 122.

The Badger, which is the only species belonging to the Plantigrade family that now occurs in Britain, is a very robust animal, of which the body is proportionally large and full; the head of moderate size, somewhat conical; the snout abrupt, with the nostrils terminal, but having a lateral slit; the eyes small, as are the ears, which are rounded; the limbs short and strong; the fore feet with five toes, of which the inner is shortest, the outer next in length, the third or middle toe longest, the claws very long, slightly arched, compressed and blunted; the hind feet also with five toes, of which the claws are short, generally worn to a stump, and the sole, as far as the heel, bare. The six upper incisors are of nearly equal size and length; between the lateral and the large, nearly straight canine tooth on each side is a vacant space;

Stewart del.

the grinders, five in number, forming a continuous series, the first small, the second and third compressed, each with a single point, the fourth broader, and the fifth nearly as broad as long, with blunt tubercles. Of the six lower incisors, the lateral are larger, and have a small external lobe, the second placed considerably farther back; the canine tooth is close to the lateral incisor, and curved; the first of the six grinders is very small, being merely a little knob, the next three compressed, with a single point, the fifth the largest, with three anterior points, and four posterior blunt tubercles; the sixth small, with slight tubercles. On the head and face the hairs are adpressed, and of ordinary texture; on the lower parts coarse, but of the nature of fur or under hair; on the upper of two kinds, a coarse fur, and still coarser and longer, stiffish, undulated, flattened and pointed hairs. The head, chin, and hind neck are white, with a broad brownish-black band on each side, from before the eye, over the ear, of which the tip is white, down the back of the neck. The throat, fore neck, middle of the breast, fore limbs, and hind feet, are brownish-black; the upper parts and sides light-grey, variegated with black, a large portion of each hair near the end being of the latter colour; the long hairs at the tip of the short tail whitish. The following are some of the dimensions of a large individual in my collection:—

	Feet.	Inches.
Length to end of tail	3	3
Length of the head	0	7

	Feet.	Inches.
Length of the neck and body	2	1
Length of tail including the hair	0	7
Length of the middle claw of fore foot	0	1¼

The Badger, although still found in many parts of England and Scotland, is in most districts extremely rare, and in none plentiful. During the day, it keeps concealed in its burrow, which it has excavated in some unfrequented part of a wood or thicket, or on the side of a hill overgrown with brakes and bushes. The interior of its domicile is described as consisting of several tortuous passages or apartments, to which, however, there is only a single entrance. Towards evening it comes abroad to search for its food, which consists of roots, earth-nuts, fruits of all kinds, insects, reptiles, eggs, and occasionally small birds and quadrupeds. It is, however, with regard to man, a perfectly harmless animal, for it neither commits depredations on his poultry, nor attacks his flocks; and therefore the persecution to which it has been subjected by him has resulted from mere wantonness, or his innate propensity to destroy or torment. Badger-baiting was formerly among "the more enlightened," and is still among the vulgar, a favourite pastime, the opportunity of indulging in which is, however, extremely rare, owing to the diminution in number which this species has undergone.

The claws of its fore feet being long and stout, its limbs muscular, its jaws possessed of great strength, its skin thick, and its fur long and coarse, it is enabled to resist the attacks of its

canine foes in a degree that might not be expected of so small an animal. Young individuals are easily tamed, and sometimes become as familiar as a dog, but their peculiar odour renders them unpleasant companions. The hair is used for the brushes employed by painters in softening the colours employed in imitating wood, and the skins were formerly made into pouches by the Highlanders. Its flesh is said to be not inferior to that of the Bear, to which it is closely allied in structure.

The female, having formed a couch of grass, brings forth three or four young ones, which do not come abroad until they have attained a considerable size. They are sometimes obtained by digging up the burrow, and the old individuals are procured in the same manner, or by fastening a bag, furnished with a running string, in the mouth of the hole, into which they rush when pursued. In Scotland, and the northern parts of England, this animal is usually named the "Brock," which is also the name given it by the Highlanders in their original language.

THE FITCHET OR FOUMART.

Mustela Putorius.—Linn.

PLATE X.

Tail about a third of the entire length; fur long, dark-brown, yellowish at the base, the lips and ears white.

Mustela Putorius. Linn. Syst. Nat. I. 167; Desmar. Mammal. 177; Jen. Brit. Vert. Anim. 11; Bell, Brit. Quadr. 156.

The Fitchet, Foumart, or Polecat, as it is variously named, is, like the other species of this genus, of an elongated slender form, which, however, is rendered less apparent by the great length of its fur. The head is of moderate size, oblong, or ovato-triangular, when viewed from above, with the muzzle rather rounded; the ears short, and broadly rounded; the neck of moderate length, and very thick; the body very long; the feet short and strong. On the anterior extremity the first toe is very short, the fifth or outer a little longer, the third longest, the fourth next, the second a little shorter than the latter. On the hind foot, the first toe is also very short, the second longer than the fifth, the third longest, but

POLECAT

the fourth almost equal. The eyes are small, with the iris dark-brown; the claws rather long, compressed, arched, and of a greyish-yellow tint. The under fur is very soft and woolly; the pile long, and rather coarse, but smooth and glossy. The general colour is dark-brown; the long hairs brownish-black, the under fur yellowish; the lower parts of the neck and body, with the feet and tail, darker than the rest, the sides yellowish-brown; the lips white, as are the ears anteriorly and along the tip behind; and between the eye and the ear is a brownish-white patch. In summer the fur becomes of a light brownish-grey tint before it is shed; and in winter is much finer and darker. The male is generally lighter and more slender than the female. Two specimens obtained in the autumn of 1836 measured as follows:—Male. Length to end of tail 17 inches; head $2\frac{3}{4}$; tail, including hair, 7. Female. Length to end of tail 17 inches; head $2\frac{3}{4}$; tail 8, of which the hair was $1\frac{1}{2}$; height at the shoulder only $4\frac{1}{2}$. The anal sac is usually represented as single; but I find that beneath the extremity of the rectum externally are two sacs, containing a yellowish fetid substance of the consistence of thick cream.

The Foumart, which is possessed of great strength and agility, generally takes up its residence in woods and copses, or thickets on the sides of hills, where it forms a burrow, or finds a retreat among stones, or in a crevice of a rock, remaining quiet during the day, and issuing forth towards evening When settled in the neighbourhood of a farm-yard,

it sometimes commits great depredations among the poultry, sucking the eggs, and killing the chickens, grown-up fowls, and even turkeys and geese. Not satisfied with obtaining enough to allay its hunger, it does not intermit its ravages until it has destroyed all within its reach, so that the havoc which it makes is not less subject of surprise than of indignation to those on whom it has inflicted its unwelcome visit. It generally perforates the skull of its victim, and is said to devour the brain first, as well as to suck the blood. If undisturbed it sometimes satisfies its hunger on the spot, and in the midst of its slaughtered victims, but in general carries off its prey to some safe retreat. Its ferocity, cunning, and extreme agility, render it a great enemy to game of all kinds; and it destroys the eggs of pheasants, grouse, and partridges, seizes the birds on their nests, pursues rabbits into their burrows, and frequently seizes on young hares. Besides birds and quadrupeds, it also feeds on fishes and frogs, which have in some instances been found in its nest. The figure intended to illustrate this species is represented, after Bewick, as carrying an eel to its retreat, in which, as related by that celebrated engraver, eleven individuals were found.

This species is generally distributed in Britain; and, although of rare occurrence in the more cultivated tracts, is not uncommon in the hilly and wooded districts. It produces five or six young in the beginning of summer. The fur is held in con-

siderable estimation, but the market is supplied from the northern countries of Europe.

The Ferret, which with us exists solely in a state of domesticity, is by some supposed to be but a variety of the Polecat, and has, at least, been known to breed with it. But it is, on the other hand, alleged that the Ferret has come to us from Africa, is extremely impatient of cold, and of a totally different colour. Our Ferrets, however, are obviously albinoes, their fur being white, and their eyes red. We know nothing of their original colour; and in form, proportions, and propensities, they do not differ remarkably from the Polecat.

THE STOAT OR ERMINE.

PLATES XI. AND XII.

Mustela Erminea.—LINN.

Tail a third of the entire length; fur short, its colour in winter yellowish-white, in summer brownish-red on the upper parts; the terminal half of the tail always black.

Mustela Erminea. Linn. Syst. Nat. I. 68; Desmar. Mammal. 180; Jen. Brit. Vert. Anim. 18; Bell, Brit. Quadr. 148.

AMONG the many individuals of this species which I have examined, some so much exceeded others in size and weight, that I was induced to suspect the existence of two Ermines in Britain; but the differences in these respects, as well as in the length of the tail, the latter depending chiefly on that of its hair, are not greater than those observed in the Weasel, Otter, and Fox; and, on comparing together a multitude obtained in different parts of the country, and at different seasons, I can discover no essential difference between them.

The Ermine is a very beautiful, and most lively

THE ERMINE IN SUMMER.

Stewart del.

Lowry sc

THE ERMINE IN WINTER.

and active little animal. Its body is much elongated, and of nearly equal thickness in its whole length; its neck rather long, and nearly as thick as the body; its head oblong, flattened above, with a rather obtuse muzzle; the tail of moderate length; and the feet short. On the fore foot the first toe is very small, the second longer than the fifth, the third longest, the fourth a little shorter; under the last joint of each is a bare tubercle. On the hind feet are also five bare tubercles, and the toes have nearly the same proportions as those of the fore feet; the soles covered with hair. The ears are rather large, broad, and rounded, with a slit in the posterior margin, forming a lobe there. The pile is shortish and soft; the hairs acuminate, a little flattened, and slightly curved or undulated; the under fur very soft and woolly; the mystachial bristles long; the coarse hairs on the terminal half of the tail very long. The dentition is similar to that of the Polecat; the teeth of the upper jaw, 3, 1, 4; of the lower, 3, 1, 5, on each side; the third grinder of the upper jaw has two small terminal and a large thin-edged middle tubercle, with a small anterior and inner process; the fourth is transverse, with three small crowded external tubercles, and a larger internal knob; the second incisor of the lower jaw is placed a little behind the line of the rest, as in the Polecat and Weasel; the two anterior grinders are obliquely conical, the third directly conical, the fourth large and three-lobed, the last merely presents the appearance of a small knob. The males

I have generally found to be smaller than the females. The following are the principal dimensions of four individuals :—

	M.	M.	F.	F.
Entire Length	15	14¾	15	17⅛
Length of head	2	1¾	2¼	2⅛
Length of neck	2	2	2	2½
Length of body	7	6½	6½	8
Length of tail	5	4½	4¼	6½
Height at shoulder	3¼	3¼	3¼	4¼

The hairs at the tip of the tail, included in these measurements, vary from an inch and a half to nearly two inches.

The fur, as in the other species of the genus, is of two kinds, both of which are in this white during winter, unless occasionally when the weather is mild, especially in the southern parts of Britain, or in the lower districts. The colour, however, is not pure white, being tinged with yellow, scarcely perceptible on the head, but increasing in intensity toward the tail, the hind parts of some individuals being pale yellow. So early as the end of March, and the beginning of April, if the weather be mild, the colour of the upper parts changes to a dull brownish-red, but the lower remain white, and the black hairs of the extremity of the tail are of the same tint at all seasons. This change is not effected by an alteration in the colour of the same hairs, but by the gradual substitution of brown for white hairs. A male, killed on the 30th March, has on the head,

the hind neck, and the middle of the back, as far as the tail, a broad band of brown, intermixed with white hairs; and the brown hairs are all much shorter than the white. A female, killed on the same day, in company with the male, has the upper parts all brownish-red, but paler than usual, with a very few small tufts of white hairs interspersed, but its fur is not shorter than that of an individual killed in December. In the former case, the summer change has commenced, and brown hairs have grown in place of the white hairs of winter; but in the latter, the winter coat had not assumed a white colour, and still remains. A female, shot at Loanhead, near Edinburgh, in the end of February 1832, was brown above, with a few white hairs, especially on the tail. There had been an uncommonly mild winter, and the animal had not assumed its white winter fur, for the red hairs did not seem to be new. On the whole, it appears to me that in spring, and the beginning of summer, when the animal had assumed its white colour in winter, all the red hairs that appear are new. Towards December, earlier if the weather be very cold, later if less so, the hairs of the upper parts become white. In an individual obtained in December 1834, the colour was a mixture of white and brownish-red. The hairs of the latter colour were not in the least degree faded, and those of the former were much shorter, and evidently just shooting; so that the change from brown to white would seem to take place by the substitution of new white hairs for those of the

summer dress. But in mild winters the hairs retain their red colour, and if new hairs come in, they are also red; if the weather become colder, the new hairs that appear are white, although the old hairs do not vary; and, if there are alternations of severe cold and temperate weather, the animal becomes mottled. It is certain that the change of season is not regularly attended with a change of colour; that great cold at any period of winter, if protracted, is accompanied with a change to white; but there is no evidence that a return of heat produces a return of the red colour in white hairs. The hairs continue to elongate from the end of spring to the beginning of winter, and the fur is certainly not longer in winter than in spring. Perhaps the hairs are renewed at all seasons, and those which grow in mild weather are brown, while those that shoot out in cold weather are red, cold having the effect of changing the structure of growing hairs, or of acting on their bulbs so as to prevent the application of colouring matter. But there is also reason to believe that sometimes the brown hairs themselves, on the application of intense cold, become whitened; for I have seen individuals of a brown colour patched with white, in which the white hairs were of the same length as the brown; but I have never met with any of which the hairs were partially coloured, or appeared to be changing from brown to white, still less from white to brown. On the whole, therefore, I think that this animal sheds its hair gradually, and in small parcels or patches, all the

year round, in the same manner as ptarmigans shed their feathers, and that so long as the weather is mild, the growing hairs are brown on the upper parts, but white when it is very cold. Thus, in March 1834, I was presented by Mr Ferguson of Raith with a most beautiful specimen on which there was not a single red hair. As to the change effected in coloured hair by intense cold, direct experience alone can determine what we are to believe concerning it, and as yet Ermines have not been subjected to this kind of observation.

It appears that in England, generally, the Ermine is less common than the Weasel; but in Scotland, even to the south of the Frith of Forth, it is certainly of more frequent occurrence than that species; and for one Weasel I have seen at least five or six Ermines. It frequents stony places and thickets, among which it finds a secure retreat, as its agility enables it to outstrip even a dog in a short race, and the slimness of its body allows it to enter a very small aperture. Patches of furze, in particular, afford it perfect security, and it sometimes takes possession of a rabbit's burrow. It preys on game and other birds, from the grouse and ptarmigan downwards, sometimes attacks poultry, or sucks their eggs, and is a determined enemy to rats and voles. Young rabbits and hares frequently become victims to its rapacity, and even full-grown individuals are sometimes destroyed by it. Although, in general, it does not appear to hunt by scent, yet it has been seen to trace its prey like a

dog, following its track with certainty. Its motions are elegant, and its appearance extremely animated. It moves by leaping or bounding, and is capable of running with great speed, although it seldom trusts itself beyond the immediate vicinity of cover. Under the excitement of pursuit, however, its courage is surprising, for it will attack, seize by the throat, and cling to a grouse, hare, or other animal strong enough to carry it off, and it does not hesitate on occasion to betake itself to the water. Sometimes when met with in a thicket or stony place, it will stand and gaze upon the intruder, as if conscious of security; and, although its boldness has been exaggerated in the popular stories which have made their way into books of natural history, it cannot be denied that, in proportion to its size, it is at least as courageous as the tiger or the lion.

When coloured red it is generally named the Stoat, when white the Ermine. In the latter state the fur is in great request for tippets, muffs, and other articles of winter apparel, the skins being disposed side by side, with a tail fastened to each, the black colour of the latter contrasting agreeably with the white or yellowish-white of the former. The fur is also employed for lining the robes of princes, nobles, and magistrates; and for these purposes is largely imported from the northern parts of Europe, where it attains a finer and denser texture than in the climate of Great Britain.

THE WEASEL.

THE WEASEL.

Mustela vulgaris.—Erxleb.

PLATE XIII.

Tail about a fourth of the length of the body, its tip of the same colour as the upper parts, which are brownish-red at all seasons, the lower white.

Mustela vulgaris. Desmar. Mammal. 179; Jen. Brit. Vert. Anim. 12; Bell, Brit. Quadr. 141.

The Weasel, in form, colour, and habits, closely resembles the Ermine, which, however, is double its size, and differs in having the extremity of the tail black, as well as in becoming white in winter. To describe its parts and proportions would be to repeat what has been said of the preceding species, its dentition being the same, its head, body, limbs, and fur similar. But its tail is proportionally shorter, the hairs towards its extremity less elongated, and its inner toes smaller. Its upper parts, sides, and outer parts of the limbs, are brownish-red, like those of the Ermine in summer, but of a brighter tint, the lower parts white or yellowish-white, and the tail in its whole length of the same

colour as the back. The entire length of an adult male is 10¾ inches, that of the tail 2½; the head measures 1¼ in length, the neck 1¾; the body 5¼.

It is generally distributed in Ireland, as well as in England and Scotland, but is more plentiful in the cultivated districts, and more disposed to approach the habitations of man than the Ermine, often taking up its abode in outhouses, stackyards, and gardens; but more frequently resorting to thickets, stony places, hedges, and stone-walls. Its food consists of small glires, such as Mice of all kinds, the Field Vole, even the Brown Rat, and the Water Vole, which it follows into their holes, sometimes Moles, frequently small birds, as young Partridges, and eggs. Although it may occasionally destroy chickens, game, and young hares or rabbits, it is probably more useful than injurious to the farmer, as it is a determined enemy to mice and rats, which it will pursue into barns, granaries, and cornstacks, despatching them generally by a single bite, which perforates the brain. In the fields and pastures it has been seen following its prey by scent, turning and doubling on the track, and pursuing it even into the water. Among grass or herbage it frequently raises itself on its hind legs to look around, and in a place of security will sometimes allow a person to make a near approach to it; but the stories which have been told of troops of Weasels or Ermines attacking men and women seem to require confirmation, and at the least to be greatly exaggerated. When its nest is plundered, however, it

defends itself against all assailants, springs upon the dogs, and even attempts to vent its fury upon their masters. It produces five or six young ones, and is said to litter two or three times in the year.

Great differences in size are exhibited by this species, and the male is said to be much larger than the female. Individuals of a white colour are sometimes, though very rarely, met with; but whether these are albinoes, or such as have changed their hue like the Ermine, has not been ascertained. It is not improbable, however, that in the north it may become white in winter, especially in subalpine situations, where I know it sometimes occurs, as I have killed one among stones on the mountain of Glamick in Skye, at an elevation of about fifteen hundred feet.

THE MARTEN.

Martes Foina.—Gmel.

PLATE XIV.

Tail, including the hair, as long as the body, excluding the neck and head; upper parts greyish or yellowish-brown, the feet and tail chocolate or blackish-brown; the throat yellow in younger individuals; in older white, that colour extending over the breast.

Mustela Martes, Linn. Syst. Nat. I. 67. Mustela Foina and Martes, Desmar. Mammal. 181, 182; Jen. Brit. Vert. An. 11. Martes foina and abietum, Bell, Brit. Quadr. 167, 174.

The Martens differ from the Weasels in form, proportions, and habits, in a much less degree than that in which the Wolves differ from the Foxes. Their body, however, is somewhat more elongated, their head a little more pointed, their fur generally longer; they have an additional molar tooth in both jaws; and the larger grinder of the lower has a small internal tubercle, which does not exist in that of the Weasels.

"It is to be regretted," says Mr Bennet, in his elaborate account of the Pine Marten, "that in subdividing the Linnæan genus, M. Cuvier should have given the name of Putorius to that section which comprehends the Common Weasel, the true Mustela of authors, transferring the latter title to the present group, which might have been more appropriately designated by the Latin name of Martes." On this hint Mr Bell, in his History of British Quadrupeds, restores the generic name of Mustela to the group of Weasels; but it will be found that this arrangement had already been made by Dr Fleming in his History of British Animals.

The Marten generally distributed in Europe has by many distinguished authors been considered as constituting two distinct species, to which, however, they have been unable to assign any more important distinctive character than that derived from the colour of the fore part of the neck, which, in what is called the Pine Marten, is yellow, but in the Common Marten, white. Linnæus, in the last edition of his Systema Naturæ, considers these white-throated and yellow-throated individuals as belonging to one and the same species, which he characterizes as having the "toes free, the body blackish-brown, the throat pale," and remarks, that "the country people make two varieties of it: *varietas duplex rusticis Fagorum gutture albo; Abietum gutture flavo.*" But almost every systematic writer since his time has considered these alleged varieties as species. It were of very little use to enter here

into a discussion on the subject, which will be found learnedly handled by Mr Bennet, in the valuable work, entitled "The Gardens and Menagerie of the Zoological Society delineated," and in Mr Bell's not less interesting "History of British Quadrupeds." The examination of individuals in different stages, and obtained in different parts of Scotland, has disclosed to me a gradation of colouring, combined with a sameness of form, that has satisfied me as to the indivisibility of the species. In fact, the "Beech Marten" and the "Pine Marten" differ less from each other, as to size, than individuals of the Polecat, Ermine, or Weasel, and the differences of colour observed are not greater than in the Common Fox.

The Marten, as represented by a specimen procured in Lanarkshire, may be described as follows:—The head is rather flattened above, of a somewhat triangular form, and tapers to a rather sharp muzzle. The nostrils are terminal, roundish, with a lateral slit; the eyes rather small; the ears short, broad, rounded, and on the outer margin toward the base slit into two laminæ. The limbs are of moderate length, being proportionally much longer than in the Weasels. On the fore foot the first toe is very short, the second and fifth equal, the fourth longest; on the hind foot the proportions are similar; the soles of all are covered with hair; and the claws are rather large, compressed, tapering, and arcuate. The incisors in both jaws are small, but deep and compressed, the lateral in the upper jaw larger and

slightly longer; in the lower jaw the lateral also larger, and the second thrust a little back; the upper canine tooth is slightly curved, the lower more curved. In the upper jaw are five grinders; the first very small and blunt, the second and third conical, each with a small anterior and posterior lobe, the third very large, longer than broad, with a middle pointed tubercle, and a small anterior and posterior projection, the fifth transverse, with three small external tubercles. In the lower jaw the first grinder is still smaller than that of the upper jaw, the second and third obliquely conical, the fourth conical, with an anterior and a posterior knob, the fifth large, with three tubercles, the sixth very small. The fur is dense, rather long and soft, longer on the hind parts, and especially on the tail. The under-fur is thick and woolly, the long hairs not flattened, but more slender toward the base, tapering towards the point, and straight; they are finer, but less glossy than the Polecat. The general colour of the upper parts is of a dull greyish-brown, lighter on the head, darker on the limbs, tail, and abdomen, where it becomes of a chocolate-brown. The inside of the ears and their external margins are brownish-white; the fore part of the neck yellowish-white. The soft fur is of a dingy yellowish-grey tint, excepting on the fore neck, where it is yellowish-white. This is not an old individual, as is shown by the teeth, which are unworn.

Length of the head and body	19 inch
Length of the tail, including the hair, which is four inches long	12
Length of the head	4¼
Length of the ears	1
Height at the shoulders	6¾

When young the Marten is of a darker colour; and at first the white on the neck does not include the chin, or extend to the thorax; it is then tinged with yellow, in various degrees, sometimes of a pale orange tint. In this state, it is the Pine Marten of authors. In winter the fur is darker, thicker, and more glossy, than at any other season. In summer it changes to a duller greyish, or yellowish-brown, very similar to that of the Arctic Fox at the same season, and the head and nape become much lighter. In old individuals, the whole fore neck, and part of the breast, are white, or greyish-white, or pale grey mottled with brownish. The yellow colour on the throat gradually fades in specimens kept in Museums, so as at length to be scarcely perceptible.

The Marten is generally distributed in Scotland and England. A fine individual, having a yellow patch on the throat, and of a rich brown on the upper parts, was brought to me when residing in Harris, having been killed by a shepherd's dog, in a cairn. There, as in the other Outer Hebrides, it is not very uncommon, residing among the blocks and loose stones on the sides of the hills, and feeding chiefly on birds. In the absence of wood of any kind, it might with more propriety be there named the Stone Marten; nor does it really appear

that in other parts of the country it is at all peculiar, in any state, to either pine or beech woods; for its favourite places of abode are rough or stony ground, on the slopes of valleys, overgrown with briers, sloes, or bushes of any kind, although it is also met with in woods. It sometimes takes up its abode in ruined buildings and hollow trees; and it can ascend a wall or a tree with as much agility as the Wild Cat; but its arboreal habits are much exaggerated by authors, and its chief exploits are performed on the ground. In the north of Scotland, where it is named Taghan and Polecat, it has been known to destroy very young lambs, but scarcely ever ventures into the vicinity of human habitations at night, as it is said sometimes to do in England, where farm-yards have been plundered by it. Whatever may be the case on the Continent, it cannot with truth be said that in Britain the Marten resides chiefly in trees, however admirably its structure may be supposed to be adapted to this mode of life. Both it and the Polecat, however, as well as the Weasels, are on occasion climbers, and, therefore, typical or aberrant representatives of the Woodpeckers and Creepers!

This species is one of the most graceful, agile, and lively of our native quadrupeds. It is said to run with great speed, sometimes to perform marvellous leaps, and to be very destructive to feathered game of all sorts; but, owing to the multiplication of game-keepers, it has become very scarce in most parts of the country, so that we now hear little of

its ravages. If the statements of authors be correct, however, it is sufficiently prolific, as it is said to have several litters of five or six cubs in the year. When taken young, it is capable of being tamed, when, as Mr Bell observes, "the remarkable elegance of its form, the beauty of its fur, and the playfulness of its manners, render it one of the most pleasing of pets."

Desmarest, who distinguishes the yellow-throated from the white-throated Marten, gives the following account of their habits, which will be found to comprise every circumstance related by our more recent describers of British animals. The former is "of a wild disposition, keeps at a distance from human habitations, and resides in the least frequented forests, and the thickest woods. It climbs trees with facility, by means of its sharp claws, and pursues birds, of which it seeks out the nest. It also attacks Squirrels, Mice, and other small quadrupeds. In spring it gives birth to two or three young ones, which it deposits in the nest of a Squirrel, after driving away or killing its owner, or in the old nests of Buzzards, Owls, and other large birds of prey." Of the white-throated Marten he says, "It prefers the vicinity of country dwellings, and even sometimes litters in the barns or hay-stores. At other times it makes its abode in the hole of a rock, or a hollow tree, in which it has previously made a bed of moss. It produces from three to seven young ones at a time, according to its age, and there is reason to think that it has two

litters in the year. In other respects, its manners are precisely similar to those of the Marten (Pine Marten) and Polecat."

The fur of this species is imported in great quantity from the colder countries of the Continent, where it is of a finer quality than with us. Besides being widely distributed there, the species is said to occur in the northern parts of Asia and America.

THE COMMON OTTER.

Lutra vulgaris.—Erxleb.

PLATE XV.

Dark-brown; sides of the head and the throat brownish-grey; tail more than a third of the entire length.

Mustela Lutra, Linn. Syst. Nat. I. 66. Lutra vulgaris, Desmar. Mammal. 188; Jen. Brit. Vert. Anim. 13; Bell, Brit. Quadr. 129.

Although attempts have been made to constitute the marine Otters of Ireland and the north of Scotland into a distinct species, they have not hitherto been successful. I have examined specimens, recent and preserved, obtained on the sea-coast and in rivers, but am unable to point out any differences

THE COMMON OTTER.

of much importance, or, indeed, exceeding such as we find in all the animals of this family. Our Otter varies much in size, as well as considerably in colour, some individuals measuring nearly four feet in length, while others, evidently adult, do not exceed three feet and a half, and the colour being of brown of various shades, with more or less grey or brownish-white on the fore part of the neck and breast. In its general form it exhibits an evident affinity to the Weasels and Martens; but it differs from them in presenting peculiarities adapting it for an aquatic life.

The head is depressed and widened, the muzzle short, broad and rounded, the upper lip being very thick, and the nose flattened. The eyes are very small, as are the external ears, which have a semicircular outline. The neck is almost as thick as the anterior part of the chest; the body very long and round; the legs short, very muscular, and exceedingly flexile; the feet with five sharp-clawed toes, which are connected by membranes extending to three-fourths of their length, the soles naked; the tail very long, muscular, thick at the base, depressed, and tapering to a point. The middle four incisors of the upper jaw are equal in breadth and length, the lateral pair considerably larger; the canine tooth nearly straight and conical; the first grinder is extremely small, the second and third conical and compressed, the fourth large, with two external compressed points, and an internal dilatation; the last with three small external points, and

an elongated inner process ending in a flattened knob. In the lower jaw the incisors are smaller, and the second placed a little behind the line of the rest; the canine more curved; the first grinder very small, conical, and compressed, as are the second and third, the fourth large, with three compressed points, the last transverse. In an individual of three feet six inches long, the œsophagus measured thirteen inches, the stomach eight inches in its transverse diameter, four between its orifices, the intestine ten feet ten inches, its average diameter ten-twelfths of an inch. The mouth is small, the tongue soft, with its terminal margin thin and jagged. The right lung is composed of four lobes, the left of two. The liver has two large lobes on the right side, two smaller on the left, and a very small intermediate lobe; the gall-bladder large; the kidneys of eleven distinct lobules.

The fur is short; the woolly hairs extremely fine, the longer flattened, acuminate, and glossy, on the tail stiffish; the mystachial bristles numerous and strong; the aperture of the ear closed by hairs, as well as an anterior flap or valve. The colour of the upper parts is dark-brown, sometimes blackish-brown; the sides of the head, and the fore part of the neck, are brownish-grey; the breast and abdomen not much lighter than the back. The claws in old individuals are generally blunted, or even worn to near the base, especially on the hind feet. The following are some of the measurements of three individuals:—

	M.	M.	F.
Length from nose to point of tail	42 in.	38	40
Length of head	5	4¾	4¾
Length of tail	16	14	16

The short palmated feet, and long muscular tail of the Otter, with its short glossy pile, indicate its aquatic habits. It lives almost entirely on fishes, which it pursues not only in rivers and lakes, but also in the open sea. In the northern parts of Scotland, and in the Hebrides and Shetland Islands, it resides among the blocks, or in the caverns along the coast, and subsists on marine fishes, seldom appearing on the streams or lakes unless in winter during very stormy weather. In the south of Scotland, and in many parts of England, it inhabits the fresh waters, and has been found on rivers at the distance of forty or fifty miles from the sea. On shore, it runs with considerable speed, but does not bound like the Weasels, and, in fact, is rather plantigrade than digitigrade. In the water it exhibits an astonishing agility, swimming in a nearly horizontal position with the greatest ease, diving and darting along beneath the surface with a speed equal if not superior to that of many fishes. It is capable of remaining immersed a considerable time, but on seizing a fish, it cannot devour it in the water, but must bring it on shore for that purpose, not always, however, carrying it to its ordinary retreat, but generally to the nearest point that seems to afford temporary security. While eating, it holds down it prey with its fore feet, or if small,

secures it between them, and commencing at the shoulders devours the fish downwards, leaving the head and tail. While thus occupied, it is sometimes visited by gulls and hooded crows, which, however, do not venture to attack it, but wait until it has finished its meal, contenting themselves with the remnants. It is alleged that it destroys great quantities of salmon, which may be the case when it inhabits rivers or estuaries in which that fish is abundant, but in the open sea it feeds on a variety of fishes. Along the coast it finds a generally safe retreat in coves of which the upper part is filled with blocks of rock, or beneath large stones; but on rivers and lakes it seeks refuge among the roots of trees, or burrows a hole for itself in the banks. Although properly piscivorous, it has been known to attack young domestic animals, and I found the stomach of one killed in June filled with a curious collection of larvæ and earth-worms.

The female is said by Mr. Bell to go with young nine weeks, and to produce from three to five young ones, in March or April. I cannot confirm or refute these assertions, but I have examined an individual so young as to be still sucking, without the lower incisors, and only 20½ inches in length, which was killed near the top of the river Don on the 25th November. At this early age the head is round and flattened, the eyes placed so near the nostrils that three lines drawn, the first from one eye to the other, the second and third from each eye to the middle point between the nostrils, form an

equilateral triangle. The hair of the lips and face is shorter and stronger than elsewhere, and of a greyish colour; under the nostrils are two nearly contiguous yellowish spots; the claws very acute, the tail proportionally shorter, and depressedly conical; the general colour sooty-brown, the lower parts a little lighter. When taken young, the Otter may be tamed, and even taught to fish for itself, or rather will, if permitted, exercise its natural instinct. A gentleman residing in Berneray, in the Outer Hebrides, had one that supplied itself with food, and regularly returned to the house. Mr M'Diarmid, in his amusing "Sketches from Nature," gives an account of several domesticated Otters, one of which, belonging to a poor widow, "when led forth, plunged into the Urr or the neighbouring burns, and brought out all the fish it could find." Another, kept at Corsbie House, Wigtonshire, "evinced a great fondness for gooseberries," fondled "about her keeper's feet like a pup or kitten, and even seemed inclined to salute her cheek, when permitted to carry her freedoms so far." A third, belonging to Mr Monteith of Carstairs, was also very tame, "and, though he frequently stole away at night to fish by the pale light of the moon, and associate with his kindred by the river side, his master, of course, was too generous to find any fault with his peculiar mode of spending his evening hours. In the morning he was always at his post in the kennel, and no animal understood better the secret of 'keeping his own side of the

house.' Indeed, his pugnacity in this respect gave him a great lift in the favour of the game-keeper, who talked of his feats wherever he went, and averred besides, that if the best cur that ever ran 'only daured to girn' at his protegé, he would soon 'mak his teeth meet through him.' To mankind, however, he was much more civil, and allowed himself to be gently lifted by the tail, though he objected to any interference with his snout, which is probably with him the seat of honour."

Otter-hunting was formerly a favourite diversion in England, and is said to be so in some parts of Wales at the present day. M. Lomare hunted the rivers in Dumfries-shire in 1833, 1834, and 1835, with great success; and Lord John Scott keeps a pack of Otter hounds, which he exercises on the streams of Roxburghshire. In general, however, the sport is now unaccompanied with the exhilarating association of circumstances that gave it its chief interest, but is undertaken in a ruder and more business-like manner. On the sea-coast, at low water, the animals are traced to the "cairns" or "coves" by dogs of the terrier breed, but often mere curs, which entering beneath or between the blocks drive them out, when they are killed with sticks or shot. I knew a man in Harris who procured in this manner a considerable number every year, when the skins were in more request than now, and who generally cooked the flesh, of which I once partook with his family. It is dark-coloured, rank, sapid enough, but not agreeably so; and un-

der the skin is a layer of fat, as in the Seals, which might render it pleasant food to a Greenlander or starving Hebridian. By the Celts the Otter is named *Balgair*, *Cu-donn*, (Brown Dog,) and *Matadh*, (Hound.) I have heard of White Otters, but have not seen an albino; although sometimes hairs of that colour are dispersed over the body, and patches on the throat.

Mr Ogilby considers the marine Otters of Ireland as constituting a distinct species; but Mr Bell states, that a specimen in the Museum of the Zoological Society of London, presented by him, does not exhibit "characters sufficiently distinct to lead to the belief that it is more than a very dark and handsome variety of the common species." This is also the case with the marine Otters of the north of Scotland, some of which are very large, and occasionally of a very dark colour. It is possible enough that there may be a marine Otter different from the common species, which is both marine and fluviatile, but as yet there are not sufficient reasons for admitting two British species.

THE COMMON FOX.

Vulpes vulgaris.—Briss.

PLATE XVI.

Yellowish-red above, white beneath; ears black behind; tail dusky towards the end, its tip usually white; the feet black.

Canis Vulpes. Linn. Syst. Nat. I. 59; Desmar. Mammal. 201; Jen. Brit. Vert. Anim. 14.—Vulpes vulgaris, Bell, Brit. Quadr. 252.

The Fox, of which several remarkable varieties occur in this country, is the only animal belonging to the Canine family that has not been exterminated. It is generally distributed, and while in the cultivated districts it is so rare as to require protection in order to furnish subjects for the chase, in some of the wilder tracts, especially in Scotland, it is even yet so numerous as to be productive of serious inconvenience,—the Foxes of these wild glens being much larger and stronger than those of the south.

In its general form the Fox approaches to that of the shepherd's dog. The head is of moderate size, with an attenuated muzzle, the neck of ordinary length, but strong, the body rather long and compact, the limbs rather slender, the tail long and bushy. The ears are large, erect, and rather pointed; the eyes of moderate size, with the pupil elliptical; the mouth opening to beneath the eyes; the snout rather small, the nostrils terminal, but with a lateral slit; the upper lip with a groove in front. There are five toes on the fore feet, the inner small and raised from the ground; four on the hind feet; the claws slightly arched, compressed, bluntish, those of the hind toes broader. In each jaw are six incisors, and two canine teeth; in the upper, six grinders on each side, in the lower seven. The upper incisors, when unworn, are generally three-lobed, the lower two lobed; the canine teeth are long, slightly curved, conical, and somewhat compressed; the anterior three grinders have considerable intervals, the rest are in contact; the former are conical, compressed, with a posterior tubercle; the fourth large, compressed, with a large conical point, a posterior elevated thin edge, and an anterior internal tubercle; the fifth broader than long, with two external and three internal points the last exactly similar but smaller; those of the lower jaw are all compressed; the first very small, the next two nearly equal, compressed, with a conical point, and a posterior tubercle, the next similar, with two posterior lobes; the fifth very large, with

two anterior edged points, and four posterior tubercles; the sixth small, with four points, the last very small, with two points.

The œsophagus of a male individual is thirteen inches long, and of the average diameter of eight lines; the stomach of an ovato-oblong form, resembling the human, its principal muscular fibres longitudinal; the intestine eight feet seven inches, the cœcum one foot six inches from the anus.

The fur is rather soft, dense, moderately long, consisting of a fine woolly covering, and long hairs of a stiffer texture; the tail bushy; the hair of the face and limbs shortish; the soles covered with hair, excepting the tuberculous eminences, on which they have been worn.

The general colour is yellowish-red, mixed with white hairs on the shoulders, thighs, upper flank, rump, and tail; the snout and lips are blackish, the inner surface and edges of the ears whitish, the outer part of the ear black, with slight spots of white; the tail pale-reddish, the tips of the long hairs brownish-black, its extremity white. The lower cheeks, under part of neck, breast, and abdomen, with the inner part of the thighs, a narrow line down the fore part of the hind legs, and the posterior and inner parts of the fore legs, white. The fore part of the feet is black, that colour extending to near the cubital and knee joints; the mystachial bristles black, the hair of the soles deep-red, the claws light-brown.

The female differs little from the male.

	M.	F.
From tip of nose to root of tail	30	28½
Length of tail, including hair	19	17½
Height at shoulder	18	18½
Height at rump	19	19½
Length of head		7½

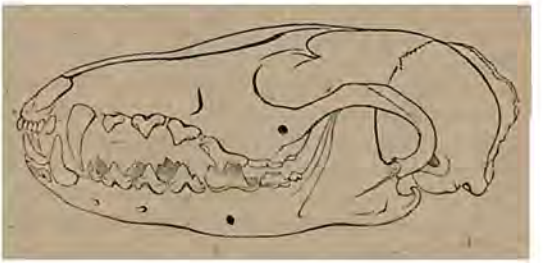
Several remarkable varieties of the Common Fox have come under my observation in Scotland. The largest kind, or that which occurs in the Highland districts, has the fur of a stronger texture, and of a greyer tint, there being a greater proportion of whitish hairs on the back and hind quarters; and two or more inches of the end of the tail white. The Fox of the lower districts is considerably smaller, more slender, of a lighter red, with the tail also white at the end. Individuals of a smaller size, having the head proportionally larger, the fur of a darker red, the lower parts dusky, or dull brownish-white, and the tip of the tail either with little white or none, occur in the hilly parts of the southern division of Scotland. The skull of the Highland Fox appears remarkably large and strong beside that of the ordinary kind, and its breadth is much greater in proportion. These variations show that little reliance can be placed upon even considerable differences in colour and proportions as indicative of a difference of species, and that the specific characters of our Fox, as given in books, must be taken with great occasional exceptions.

The history of the Fox is better known than that of many of our wild quadrupeds. It resides in burrows, which it excavates for itself in sandy or gravelly soil, in woods or thickets, or on shady banks, or the slopes of hills, remaining concealed all day, and coming abroad towards evening. Its food consists chiefly of the flesh of quadrupeds, birds, and reptiles. In the wilder parts it often destroys lambs, and in the more populous, frequently commits great havoc among poultry; but its favourite game is partridges, grouse, rabbits, and leverets. Insects and worms have also been found in its stomach, and in the maritime districts it has been known to frequent the shores in quest of crustaceous and molluscous animals.

It lives in pairs, and the young, from three to five in number, are born towards the end of spring. The female exhibits great courage and address in defending them. The sagacity of the Fox is proverbial, and frequently enables it to escape the snares laid for it. Marvellous stories are related respecting the stratagems which it employs to elude pursuit; and although many of these may be exaggerated, there can be little doubt that its instinctive vigilance and cunning are great. When obtained young it may be domesticated so far as to allow a person with whom it is acquainted to handle it, but cannot be depended upon, as it exhibits no gratitude towards benefactors, forms no strong attachment, and is ever ready to embrace the opportunity of making its escape. It is said to attain the

age of fourteen or fifteen years in a state of captivity.

Ignoble as the Fox may be in point of strength and courage, it is now almost the only predaceous animal that remains with us to exercise the faculties of our hunting gentry; and, in the more populous parts of the country, it could scarcely maintain its existence, were it not protected for this purpose.



THE WILD CAT.

Felis Catus.—Linn.

PLATE XVII.

Yellowish-grey, with an interrupted longitudinal black band on the back, two dusky stripes on the cheeks, and numerous transverse bands of the same colour on the body and limbs; tail about half the length of the head and body, cylindrical, ringed and tipped with black.

Felis Catus. Linn. Syst. Nat. I. 62; Desmar. Mammal. 232; Jenyns, Brit. Vert. Anim. 14; Bell, Brit. Quadr. 177.

The family of rapacious quadrupeds to which the species now under consideration belongs, is composed of animals that exhibit the form and structure most obviously adapted to a life of rapine. The flexibility of their spine, the muscularity and suppleness of their limbs, their hooked and contractile as well as retractile claws, their short jaws, of which the lower is strictly confined to a vertical motion, their long canine teeth, and thin-edged grinders, together with their irritable temperament,

THE WILD CAT.

insidious disposition, and capability of performing extraordinary bounds, render them pre-eminently destructive, and afford the characters which distinguish the Felina or Cat tribe. The Lion, the Tiger, the Jaguar, the Puma, the Panther, and the Leopard, which are confined to the warmer regions of the globe, exhibit the sanguinary nature of this tribe in a higher degree than the Lynxes and Cats, only because they are superior in size, for the species which exists in Britain is not less predaceous in proportion to its bulk. This animal, which is much larger than the domestic Cat, is now seldom met with, having been destroyed in all the populous districts, and is confined to part of Wales, the mountainous districts of the North of England, the Highlands of Scotland, and some portions of Ireland, where it resides in the woods and thickets, generally taking up its abode in the fissures of rocks, or in the cavities between blocks of stone.

In its aspect, form, and colouring, the Wild Cat closely resembles large individuals of the domestic race, and of the grey striped or tabby variety, but differs in having the body more elongated, the limbs also longer, the fur more copious, and the tail consequently thicker. Its head is short, broad, convex above, anteriorly of a somewhat triangular form; the snout small; the nostrils rather small and linear; the eyes large; as are the ears, which are ovate, erect, and somewhat pointed. The mouth is rather small, opening to beneath the posterior angle of the eye. The palate is marked with eight transverse

ridges, the middle ones of which have a thin culmen, with a series of papillæ on either side, the whole presenting a remarkably beautiful appearance. It is flesh-coloured, with a few smallish black spots. The tongue, which is rounded and thin at the end, with a slight notch, is covered above with numerous conical horny papillæ directed backwards. The incisors, six in each jaw, are very small, the lower especially, nearly even, bluntish, the lateral larger. The canine teeth are long, conical, acute, with a bluntish edge posteriorly; the upper slightly curved, and longer, with a ridge and two grooves externally, the anterior groove obsolete, the lower smaller, a little more curved, with a ridge and a single groove. Of the four molares in the upper jaw, the first is very small, and equidistant from the canine tooth and second grinder, which is compressed, conical, with a small process behind; the third elongated with three prominences, of which the anterior is small, and an internal anterior small tubercle; the hind tooth very small, and transverse. In the lower jaw, the first molar, placed at a distance from the canine tooth, is compressed, conical, with an anterior and two posterior small tubercles; the second similar, but larger; the third much larger, with two thin-edged points. The limbs are rather long, and moderately stout, the anterior with five, the posterior with four short toes; the claws retractile, unciform, compressed, deep at the base, and acuminate. On the sole of the fore foot is a large three-lobed prominence, four oblong promi-

nences, one under the last joint of each toe, and a small papilliform eminence under the carpal joint; on that of the hind toe a three-lobed, and four digital oblong prominences. The body is long, compressed, rather slender; the tail long, slender, and tapering, but owing to the length of the hair upon it seeming thick, cylindrical, and generally as broad towards the end as at the base, although often narrowed at the tip. There are four rows of long white mystachial bristles; two or three of the upper row black. Five or six supra-ocular bristles, which are white, the uppermost, however, black; three or four smaller white bristles a little behind the angle of the mouth, and a like pencil half an inch above it. The fur is thick, long, and soft, the pile or long hairs slender and taper-pointed. The hair on the muzzle and feet beyond the tarsal and carpal joints, as well as on the ears and pudic region, is short; that of the lower parts in general, and of the posterior abdominal region in particular, longest.

The teeth are white, the eyes hazel, the snout dark flesh-coloured, the bare prominences of the soles black. The general colour of the fur on the upper and lateral parts is pale reddish-brown, nearly unmixed on the muzzle and paws. Between the eyes, four tortuous brownish-black lines commence, narrow and close together at first, and proceed diverging and becoming broader, to the lower part of the neck. Between the scapulæ commence three black lines, the lateral of which curve, and are continued over the sides, while the central, running

along the whole ridge of the back, forms a broad irregular undulating band, from which proceed bars of the same colour passing over the sides. The tail is marked with nine bands, of which the first five are small, and do not meet beneath, the rest annular and enlarging, the terminal by about two inches in breadth, and deepest in tint. A narrow black line from the posterior angle of the eye, and another from a little beneath it, nearly parallel, and terminating on the cheek, somewhat farther back than the ear. The bare edges of the lips are blackish; their hair and the chin yellowish-white; the lower parts of the neck of a uniform pale reddish-brown. There is a pure white spot at the junction of the neck and thorax. The pectoral region white, with roundish black spots; the abdominal reddish, and similarly spotted, its lower part pure white; that of the pubes, and the posterior part of the thighs, bright yellowish-red, which colour extends a little down the tail; the genital region blackish, with very short hairs. The fore legs are transversely barred with black; their posterior part, opposite the elbow-joint, black, mottled with whitish, the under part of the feet black; the hind legs barred in the same manner, and also black beneath. The claws are yellowish-grey.

The softer hairs or fur are, in general, of a pale-purplish tint, and pale-reddish at the extremity; the longer hairs white at the base, then black, afterwards yellowish-red, with the tip black. Others, however, are first white, then black, yellowish-

black, and finally reddish. There are a few very long white hairs on the loins inferiorly and laterally. On the white parts, the hairs are of that colour from the base; on the bright-red intercrural part they are for a short space at the base bluish. The terminal rings of the tail have the hairs entirely black, but the black hairs of the feet have their base pale.

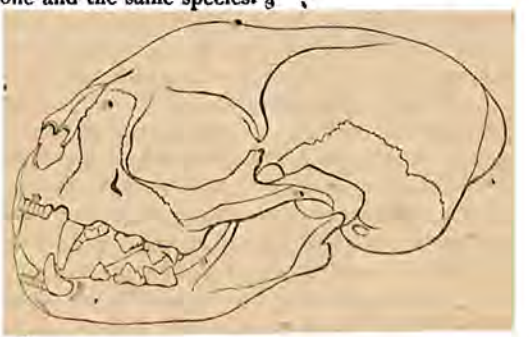
The male here described was in length three feet four inches, the head measuring five inches, the neck and body twenty-one, and the tail fourteen. A female, two feet six inches in length, the head four inches, the neck and body seventeen, the tail ten. The latter has the face brownish-grey, whitish on the upper lip in front and over the eyes, at the inner angle of which is a dusky band or patch. The head and cheeks grey, the latter crossed by two black lines, as in the male. The general colour of the fur is brownish-grey, but the markings are as in the male, the belly less white, the limbs toward the end and on the inner side yellowish-brown, and the soles black. An individual killed in Stirlingshire is of a yellowish-grey colour all over, not much lighter on the abdomen, the ears, cheeks, and muzzle, light yellowish-red, the throat and margins of the upper lips white. The dark markings are as described in the male, but of a browner tint; there are two black bands on the cheek, and nine rings on the tail, of which four only are complete, the last or terminal one two and a half inches long. All the long bristles on the head are white, excepting two on the

upper lip; the claws pale horn-colour; the soles are black, and the whole under surface of the feet brownish-black, with a tuft of whitish hairs anterior to the pads. Length to end of tail 35 inches, the head $4\frac{3}{4}$; the neck and body $23\frac{1}{4}$; the tail $12\frac{1}{2}$. I have been induced to be thus particular, because I have not seen a detailed description, nor an accurate figure of this animal, in any work.

The habits of the Wild Cat are as yet little known, no British zoologist seeming to have made personal acquaintance with it. I have not met with it in its native haunts, but have had an opportunity of seeing a captive, which exhibited extreme ferocity, hissed and spit, and screamed on the approach of strangers, curving its back, erecting its fur, and attempting to fly upon them. By shepherds and other country people, it is said to prey upon game, hares, young lambs, and various species of birds and small quadrupeds; to live solitarily or in pairs, in the clefts of rocks, to frequent woods and thickets, seldom or never approaching human habitations, to climb trees with great facility, and to be an object of fear to any one meeting with it, although I have not heard of any personal injury which it has inflicted. It seems to be more abundant in the woods of the counties of Perth, Aberdeen, and Argyll, than in any other part of Scotland, and specimens from these districts are not very unfrequently sent to Edinburgh to be prepared.

It is said to occur in all the wooded tracts of the continent, as well as in the north of Asia, and is

generally supposed to be the original of our Domestic Cat, which, in anatomical structure and external form, certainly does not present greater differences than might be expected to result from so great a change in its food and habits. The Tame Cat is smaller than the Wild, because it is not supplied with its natural food in sufficient quantity; and its tail is thinner and more tapering, because its fur is much shorter; but individuals of the domesticated race are sometimes met with, which exhibit scarcely any difference from the Wild Cat, and it remains to be proved that several species, whether of quadrupeds or of birds, can combine to constitute by breeding together a prolific mixed race. The skull and teeth of a Domestic Cat differ much less from those of a wild individual, than do skulls of our Highland and common Foxes from each other, although no one doubts that all our Foxes are of one and the same species.



THE SEALS.

THE Amphibious Quadrupeds, properly so called, compose a group of which, notwithstanding the pains that have lately been bestowed upon its elucidation, our knowledge is still in a very unsatisfactory state. They are characterized by having the feet formed for swimming, the toes being connected by the skin, the hind feet expanded, and directed backwards. The five species that have been found on our coasts are referred to two genera, *Phoca* and *Trichechus*. In the former there are six incisors above, four below; conical, curved canine teeth of moderate size; five grinders on each side, in both jaws, the anterior grinder with a single root, the rest with two, all with a large conical, compressed point, an anterior and a posterior prominence, of which the latter is often two-lobed, but which in one species are scarcely apparent. The genus *Trichechus* is distinguished by the great tusks in the upper jaw, and the absence of canine teeth in the lower. In the young individuals of the Walrus there are six incisors above, and four below; but these teeth fall out before the animal attains maturity. The Seals of the British seas remained in a great measure unknown to naturalists, until the recent visit of Professor Nilsson to England, when he found occasion to point out the

peculiar characters of the species. Until two years ago, only a single species, *Phoca vitulina*, was tolerably well known, and even its characters were by no means satisfactorily traced; while the other species, generally considered as *Ph. barbata* of Muller, was incorrectly so named. In consequence of the light imparted by the Swedish professor, Mr Bell was enabled, in 1836, to add to the list two species, and to correct the synonymy and descriptions of the other two. It has been found that too much importance had been attributed to colour, which in these animals is exceedingly variable, and that the only satisfactory characters are derived from the form and disposition of the teeth. Now, that these four British species are well characterized, we marvel how observers had so long been ignorant of their distinctions, and are induced to expect that several more will be added to the number, as it will be easy to ascertain, on the occurrence of an individual, whether it may be referred to any of those already described. In three of our species, the grinders have at least three points, but in the fourth the large central point only remains, the rest having become obsolete. In consequence of this simply conical form of the teeth, the species in question has been placed in a different genus from the Seals, but its general structure is in all essential respects similar to that of the latter, and I am unable to perceive the propriety of separating the Grey Seal from the other species.

The Common Seal is at once distinguished from

the rest by having its grinders four-lobed, and placed obliquely in the jaws. The Greenland Seal has the grinders generally three-lobed, arranged in a direct series, and having a small interval between them, the first toe of the fore foot longest. The Great Seal has the grinders also three-lobed, and placed in a direct series, but much smaller in proportion to the size of the animal, and the third or middle toe of the fore foot longest. Lastly, the Grey Seal is known by its conical, unlobed grinders.

Stewart del.

Lizars sc.

THE COMMON SEAL

THE COMMON SEAL.

Phoca vitulina.—Linn.

PLATE XVIII.

Muzzle obtuse, outline of forehead concave; grinders four-lobed, obliquely placed in the jaws; pile yellowish-grey, mottled with dusky on the upper parts; fore feet with the first toe longest.

Phoca vitulina, Linn. Syst. Nat. I. 56; Desmar. Mammal. 244; Jen. Brit. Vert. An. 15; Bell, Brit. Quadr. 263.

The species of Seal commonly seen along our coasts, and abundant among our northern islands, as well as occasionally in the estuaries of our larger rivers, sometimes attains a very considerable size, measuring five or six feet in length, but is more frequently met with of much smaller dimensions. An individual, from the Frith of Forth, which I shall describe as the representative of the species, measures nearly four feet in length.

The head is of moderate size, ovate, depressed, its outline convex behind the eyes, anteriorly con-

cave, the muzzle narrowed, but rounded. The neck is short, full, and round; the body elongated, large, round, of nearly equal girth for half its length, then tapering to the tail. The fore limbs are very short; the foot of an oblong form, its anterior outline curved. Of the five toes the first is longest, the rest gradually shorter. The claws are long, tapering, roundish, with a blunt point. The fore legs are widely separated; the hind ones, on the contrary, are closely approximated, directed backwards and inwards, involved in the skin, and becoming free only at the ankle joint. The foot is at first round, but the toes expand so as to form a fan-shaped paddle of a triangular form, having its terminal outline concave; the first toe a little longer than the fifth; the claws of moderate length, very slender, nearly straight, depressed, and tapering to a blunt point. The tail is very short, flattened, and blunt. The nostrils are linear, ten and a half *lines* in length, anteriorly two lines and three quarters distant from each other, posteriorly ten lines and a half. The eyes are large, prominent, and placed two inches apart. The apertures of the ears very small, with a conical flap in front.

The pile or fur is short and stiffish, with short woolly hairs intermixed; the mystachial bristles stiff, tapering, flattened, and alternately enlarged and contracted; the longest four inches. The general colour of the fur is yellowish-grey, the upper parts variegated with dark greyish-brown in irregular patches, and becoming paler on the sides; the claws

black. The iris is brown, the pupil greenish, the hind part of the eye internally being greenish-blue.

In the upper jaw the six incisors are of a somewhat conical form, the outer much larger; the canine teeth strong, conical, considerably curved, and faintly marked with numerous longitudinal grooves; the five grinders on each side are placed obliquely in the jaw, the anterior extremity of one passing internally of the posterior extremity of the next. The first is smaller, with a single root, four external points, and an internal tubercle; the rest have two roots, and are nearly of uniform size, each having a large compressed conical point, an anterior tubercle, and two posterior small points. The last grinder is placed at a considerable distance from the fourth, but the rest are approximated. In the lower jaw, the four incisors are conical and blunt; the canine teeth curved, and longitudinally grooved; of the five grinders on each side, four have a large conical point, an anterior small tubercle, and two posterior small points, the last grinder a large point, with two anterior and two posterior small tubercles. The œsophagus is about two feet in length; the stomach large, membranous, in the form of an ovato-oblong sac, eighteen inches in its greatest diameter; the intestine forty-nine feet long, its diameter uniform, being about eight lines, in the rectum thirteen lines.

	Feet.	Inches.
Length to end of tail	3	10½
——— of head	0	8
——— tail	0	3½
Circumference of neck anteriorly	1	6½
——— at the base	1	10
——— body behind the fore feet	2	5
——— at its thickest part	2	7
——— at the end part of thorax	2	2
——— at root of tail, including feet	1	0
Breadth between fore legs	0	10½
Length of free part of fore foot	0	7½
——— hind foot	0	9

This species varies in colour as well as in size. The young are at first of a light bluish-grey above, clouded with darker, yellowish-grey beneath, and the first coat of hair is longer and more bristled than the rest. When the pile is about to be shed it becomes of a uniform pale greyish-yellow or whitish tint. In young individuals the spots are darker and more numerous; in very old ones, they are few, larger, and generally brown. The claws, at first flattened or cylindrical, become deeper and more or less carinate, often triangular in their transverse section.

The Common Seal frequents estuaries, sea-lochs, bays, and the channels between islands, where it may be seen occasionally protruding its head above the surface, sometimes following a boat or vessel at a distance, but generally keeping beyond reach of

shot. It feeds exclusively on fishes, in pursuit of which it can remain several minutes immersed. At low water, it often betakes itself to rocks or small islands, on which it reposes until the return of the tide; and I have seen droves of twenty or more individuals thus basking in the sun. In estuaries they sometimes repose on the sands, where they are liable to be surprised, if the water be distant, for their movements on land are extremely awkward, and their hurry in endeavouring to escape when approached affords an amusing sight, as they seem to tumble about in a ludicrous manner, throwing themselves headlong into the water from the rocks. When there are caverns on the coast, they find a more secure retreat in them, where, if attacked, they can escape by diving. They are frequently shot, either with ball or buck-shot; but unless killed outright are liable to be lost, as they dive, and are seldom seen again; or, although killed, unless the boat is quickly at the spot, they sink to the bottom, young or lean individuals more rapidly than the older and fatter. When attacked with sticks, while on shore, they have been known to seize the weapon in their jaws and carry it off; and they are more easily killed by a blow on the muzzle than on the upper part of the head.

Seals may sometimes be induced to come nearer a boat by whistling, and they are said to be attracted by music, even that of the bagpipe. In a state of confinement they are gentle, and if obtained young, manifest considerable docility, and become attached

to their master. In their natural state they do not seem to exhibit the intelligence which they might be inferred to possess from the great size of their brain, and the predominance of their cranial over their facial region; but their mode of life renders opportunities of observing their habits rare. They, however, show the social propensity, for when their labours are over, they repose in company, and vast multitudes are sometimes seen ashore on remote islands. Their affection toward their young is also great, and they may be enticed within shot, or even brought on shore, by imitating the whining cry of the cub, especially if they have been deprived of it.

The following interesting account of the habits of Seals in the Hebrides has been furnished by the Rev. Mr Dunbar of Applegarth, in a letter to Mr Lizars:—

"The fondness of these animals for musical sounds is a curious peculiarity in their nature, and has been to me often a subject of interest and amusement. During a residence of some years in one of the Hebrides, I had many opportunities of witnessing this peculiarity; and, in fact, could call forth its manifestation at pleasure. In walking along the shore in the calm of a summer afternoon, a few notes of my flute would bring half a score of them within thirty or forty yards of me; and there they would swim about, with their heads above water, like so many black dogs, evidently delighted with the sounds. For half an hour, or, indeed, for any

length of time I chose, I could fix them to the spot; and when I moved along the water-edge, they would follow me with eagerness, like the Dolphins who, it is said, attended Arion, as if anxious to prolong the enjoyment. I have frequently witnessed the same effect when out on a boat excursion. The sound of the flute, or of a common fife, blown by one of the boatmen, was no sooner heard, than half a dozen would start up within a few yards, wheeling round us as long as the music played, and disappearing, one after another, when it ceased.

"Other occasions occurred during my residence in those islands of witnessing the habits of these creatures. While my pupils and I were bathing, which we often did, in the bosom of a beautiful bay in the island, named, from the circumstance of its being a favourite haunt of the animal, Seal Bay, numbers of them invariably made their appearance, especially if the weather was calm and sunny, and the sea smooth, crowding around us at the distance of a few yards, and looking as if they had some kind of notion that we were of the same species, or at least genus, with themselves. The gambols in the water of my playful companions, and their noise and merriment, seemed, to our imagination, to excite them, and to make them course round us with greater rapidity and animation. At the same time, the slightest attempt on our part to act on the offensive, by throwing at them a stone or shell, was the signal for their instantaneous disappearance, each, as it vanished, leaving the surface of the

water beautifully figured with a wavy succession of concentric circles.

"On hot days in summer, I have seen great numbers of them stretched in groups on the rocks at the bottom of Seal Bay, which had been left dry on their upper surface by the receding tide. There they would lie lazily along, basking in the warm sun, like so many large swine, and nearly of the same colour. These were, I believe, a species of much greater size, and of a lighter colour than my musical-eared friends already spoken of; and as far as my observation goes, not at all alive to the harmony of sweet sounds. I may, however, be mistaken in this last particular—I speak only of what I have witnessed.

"The fishermen on the island used to assert that, like many other animals both of the land and the water, they never repose without stationing a sentinel on the watch. I cannot positively confirm this; but I have often observed that, during the general slumber, one of the number, but not always the same individual, would raise its head for a second or two, turning it half round, and again stretch itself in repose. Ever and anon, too, we would hear from some one of the group a melancholy moan coming slowly over the surface of the deep, wild and savage in the sound, and not unlike, perhaps, what we may suppose to be 'the wolf's long howl from Oonalaska's shore.'

"In situations like the above, I have sometimes let fly a ball at them, but not being an expert marks-

man, and their watchfulness preventing me from getting very near, I never had the luck to hit. But I succeeded always in putting them in bodily fear, and had my failure somewhat compensated by witnessing the hurry-scurry that immediately ensued; the unwieldy monsters floundering and waddling in awkward haste to gain the edge where the rock was flat, and rolling down where there was a declivity, tumbling like a sack of grain into the water, and causing the whole Bay to resound with the splashing."

In the Northern Islands, considerable numbers are annually killed, although their capture is not there made a regular branch of industry. The flesh is dark-coloured and rank, but that of young individuals may be eaten; the fat, which forms a layer beneath the skin, affords oil of excellent quality; and the skins are used for covering trunks as well as for being manufactured into leather. It is only in the arctic regions, however, that Seals are obtained in quantities sufficient to render their pursuit of importance; and there they are of the greatest value to the inhabitants, affording them food, clothing, and light.

The female brings forth her young in a cavern, or among the rocks, where it remains concealed for some days. According to the information which I have received from the country people, only one is produced at a birth, and generally in the middle of summer. In form and habits, this species is very nearly allied to the next, from which, however, it is

easily distinguished by the form and arrangement of its teeth.

In the Common Seal there are seven cervical, fifteen dorsal, five lumbar, three sacral, and eight cervical vertebræ. On the fore foot the first toe is longest, the second, scarcely shorter, the rest graduated. The first toe of the hind foot is also longest, the second next, the fifth or outer next, then the fourth, the third shortest.

THE GREENLAND OR HARP SEAL.

Phoca grœnlandica.—MULLER.

PLATE XIX.

Muzzle obtuse, outline of forehead straight; grinders three-lobed or five-lobed, placed directly in the jaws, with considerable intervals; pile yellowish-grey or whitish, unspotted, or variously blotched with brown; fore feet with the second toe longest.

Phoca grœnlandica. Muller, Zool. Dan. Prodr. p. 8; Fabr. Fauna Grœnland. 11; Desmar. Mammal. 245; Bell, Brit. Quadr. 269.

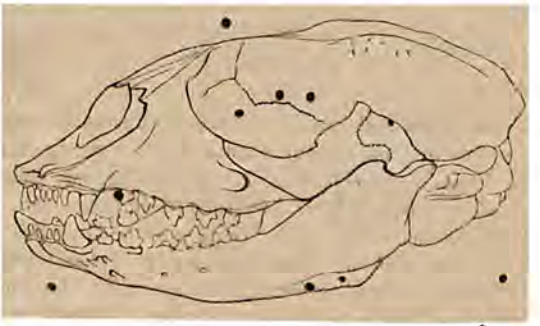
THE Greenland Seal was first added to our Fauna by Mr Bell, on the authority of Dr Riley, who exhibited at the meeting of the British Association at Bristol, in 1836, two skulls, which, although considered by Professor Nilsson to belong to *Phoca discolor* of M. F. Cuvier, were subsequently found to present the characters of the present species. Several years ago, an individual, obtained from the

mouth of the Frith of Forth, came under my observation, and, although I then considered it as a different species, I am now persuaded that it belonged to the present. It was thirty-nine inches in length, the head being $6\frac{1}{4}$, the tail $2\frac{1}{2}$. The incisors conical, compressed; the canine teeth conical; the grinders bicuspid. On the fore foot the second toe longest, the first slightly shorter; the claws large, triangular in their transverse section, and slightly curved. The mystachial bristles flattened and undulated; the fur of longish flattened hairs, of a yellowish-white colour. There is another specimen in the Museum of the University of Edinburgh, of nearly the same size, and in all respects similar.

The skull of this species is less convex above than that of *Phoca vitulina*, and straighter in front, the nasal bones being less declinate. The incisors of the upper jaw are compressed, conical, a little recurved, and somewhat distant from each other; the canine teeth conical and curved; the grinders are similar to those of the Common Seal, but more deeply lobed, the posterior lobe sometimes simple, but often presenting a very small lobule; they are placed at intervals of about half their breadth, and are not oblique, but direct. The four inferior incisors are smaller than the six upper; but the other teeth resemble those of the upper jaw. The pile differs very little from that of the Common Seal, the bristles being less distinctly undulated, and the hairs somewhat longer. The colour varies ac-

cording to the age of the individual. It is said that in the fœtus the pile is white and woolly; in the first year somewhat less white; in the second year grey; in the third and fourth spotted with brown; in the fifth greyish-white, with the head dusky, and a large crescent-shaped band of brown on the back and sides, whence the name of Harp Seal.

It inhabits the Northern Seas, being abundant in Greenland, Davis' Straits, and Spitzbergen. If it occurs in considerable numbers on our coasts, it has not yet attracted attention, having been confounded with *Ph. vitulina*, and *Ph. Gryphus;* and, considered as a British animal, its history is entirely unknown.



THE GREAT SEAL

Phoca barbata.—Muller.

Muzzle very broad, the lips being remarkably tumid; teeth very small, grinders three-lobed, direct, at small intervals; pile brownish above, yellowish-grey beneath; fore feet with the third toe longest.

Phoca barbata, Muller, Zool. Dan. Prodr. 8; Fabr. Fauna Grœnland. 15; Desmar. Mammal. 246; Bell, Brit. Quadr. 274.

The Great Seal has not hitherto been satisfactorily proved to occur on our coasts; for the accounts of it given by Dr Fleming, Mr Jenyns, and Mr Bell, none of whom have taken their descriptions from British specimens, obviously refer to the Grey Seal, *Phoca Gryphus*. The Haaf-fish of Shetland and Orkney, which Dr Fleming considers as *Ph. barbata*, is proved by the skeleton in the Museum of the Edinburgh College of Surgeons to be the Grey Seal; and all the "Great Seals" of other authors, admitted merely on report, probably belong to the same species.

In the Museum of the University of Edinburgh is a Scottish Seal five feet five inches in length, which, by the smallness and form of its teeth, and the length of the third toe of its fore foot, is shown to belong to this species, although the form given it by the preparer is more robust than it is described as being. The mystachial bristles differ from those of our other Seals in being destitute of undulations; the fore feet are not less different, as they have the third toe longest; the forehead is more convex, and the muzzle much broader. In this specimen the pile is yellowish-grey, on the top of the head light-yellowish, along the back brownish; the anterior claws large, carinate, a little curved, and blackish; those on the hind feet slender and tapering. In order to enable those who may meet with an animal corresponding with this to determine its species, I subjoin here a description of *Phoca barbata*, drawn up from a Greenland specimen in the same collection, the form of the teeth being obtained from other sources.

The incisors, six in the upper, and four in the lower jaw, are small and conical, the outer much larger; the canine teeth conical and slightly curved; the grinders in a direct series, with small intervals, nearly uniform, having a large conical and two small lateral points. The length of this individual to the end of the tail is nine feet. The head is rounded above, the muzzle broad and convex. On the fore feet the first and fifth toes are equal, the second and fourth much longer, the third longest.

On the hind feet, the first and fifth toes are nearly equal, the rest shorter. The claws of the fore feet are large, carinate above, concave beneath; those of the hind feet smaller and depressed. The mystachial bristles are flattened and even; the pile short. The fore part of the head is brown, the top light yellowish-grey; the hind neck, and an obscurely defined space along the back, including the tail, dull brown, the rest dull yellowish-grey.

THE GREY SEAL.

" Phoca Gryphus.—Fabr.

Muzzle very deep, outline of forehead straight; grinders distant, direct, conical, compressed, destitute of anterior and posterior tubercles; pile yellowish-grey, mottled with dusky.

Phoca Gryphus. Fabr. Skr. Naturh. Selsk. I. p. 167; Halichœrus griseus, Nilsson, Skand. Fn. I. p. 577; Halichœrus Gryphus, Bell, Brit. Quadr. 278.

The Grey Seal, which attains a much larger size than the common species, and is at once distinguish-

ble from it by its more flattened forehead, deeper muzzle, and more elongated form, is not uncommon on our northern coasts. It is said to attain a length of ten feet or more; but the largest individual that has come under my observation did not exceed seven. A male, probably about six months old, and only three feet nine inches in its greatest length, obtained in Harris, on the 27th March 1817, presented the following characters:—From the shoulders to the umbilicus the body is nearly cylindrical, from that to the sacral extremity conical; from the shoulders to the snout, when the head is extended, the form is that of a short rounded cone, bulging a little at the head. The latter is flattened above, with its upper outline straight, the upper lips thick, but not bulging immoderately, the nose broad, the nostrils roundish, with a lateral diverging slit, the mouth of moderate size, the lower jaw short, the eyes rather small, the ears destitute of auricles, and placed a little behind the eyes. The limbs are short, the fore feet broad and depressed, the first toe longest, the rest gradually decreasing; the claws large, somewhat triangular or carinate, slightly curved, with the tip obtuse. The hind feet, which are much larger, are, when expanded, fan-shaped, the lateral toes largest, the middle toe shortest; the claws much smaller than on the fore feet, nearly straight, depressed, and tapering. The bristles on the upper lip large, stiff, flattened, undulated on both margins, and disposed in six rows, decreasing upwards. In this individual, the process of depilation was going

on; the old pile was whitish; the new, which was perfect only about the neck, was of a beautiful pale bluish-grey, very short, and thickly set. The mystachial bristles yellowish, the anterior claws black, the posterior paler. Upper incisors (six) very deep, compressed, blunt, the outer very large; lower (four) smaller, more conical; the canine teeth conical, and a little curved; the grinders, five on either side in both jaws, conical, flattened on the mesial aspect. The tongue fleshy, flat, rounded at the extremity, but rather deeply emarginate. The eyes orbicular, the iris dark-brown, the lens nearly globular, the pupil dark-green, changing to light-green, and shining, the central part of the choroid being of a most beautiful blue.

An individual of this species, in the Museum of the University of Edinburgh, is six feet nine inches in length, to the tip of the tail; the mystachial bristles are flattened and undulated; the pile yellowish-grey, more yellow beneath, with faint roundish patches of dusky, which are more conspicuous on the lower parts of the sides.

A good skeleton in the Museum of the Edinburgh College of Surgeons measures six feet to the end of the tail. The skull differs from that of the Common and Greenland Seals, more especially in having its upper outline straight to the extremity of the nasal bones, which in those species are declinate, in being thus higher in front, in having the ridge formed by the anterior part of the frontal bone, between the orbits much broader, and the palatal hole

placed in the palatal bones, it being in the maxillary bones in these species. There are 7 cervical, 15 dorsal, 5 lumbar, and 3 sacral vertebræ, as in the Common Seal; the caudal vertebræ 10, but some are obviously wanting. The hind feet extend 13 inches beyond the tail. Of the fore toes, the first is longest, (6½ inches,) the rest gradually decrease, excepting the third, which is nearly as short as the fifth. Of the hind toes the first is longest, (10¼ inches,) the fifth next, (9½;) the second, third, and fourth are nearly equal. In this skeleton the teeth are imperfect; but in a skull from Orkney, of which the lower jaw is wanting, they are complete and unworn. The incisors of the upper jaw are very deep, somewhat conical, and obtuse, the lateral very large; the canine conical and curved; the grinders distant from each other, direct, conical, compressed, with an anterior and a posterior shoulder, but no process or lobe. The four incisors of the lower jaw smaller, but similar; the canine conical; the first grinder conical, as is the second; the rest a little compressed, and all with a slight prominence or shoulder anteriorly and posteriorly. The first grinder in both jaws has a single root, the others two; the last grinder in the upper jaw is more distant, and all the grinders and canine teeth are faintly grooved on their outer surface.

The Grey Seal is said to attain a length of eight or ten feet, and to vary much in colour, but generally to be of a yellowish-grey, marked with dusky spots, sometimes faint, but occasionally very dis-

tinct. It has been found by Mr Ball on the south coast of Ireland. According to Mr Bell, there is a specimen in the Bristol Institution which was taken in the Severn; Mr Edmonston gives notice of its occurrence in Shetland; I have seen two specimens from Orkney, examined one in Harris, and have reason to believe that it is not uncommon in the Outer Hebrides. On the rock of Gaskir, twelve miles from Harris, in the Atlantic, it is found on shore in great numbers, along with its young, and with the Common Seal, in the end of autumn or beginning of winter, and so many as a hundred and twenty Seals have been killed there on one day. In Mr Bell's History of British Quadrupeds will be found a good account of this species by Mr Ball, who remarks that "it appears scarcely susceptible of domestication, and the development of its skull seems to indicate as much, for the size of the brain of a specimen nearly eight feet long did not exceed that of one of *Phoca vitulina* of less than four feet."

Stewart del.

Lizars sc.

THE WALRUS.

THE WALRUS.

Trichechus Rosmarus.—Linn.

PLATE XX.

Trichechus Rosmarus. Linn. Syst. Nat. I. 49; Desmar. Mammal. 253; Jenyns, Brit. Vert. Anim. 16; Bell, Brit. Quad. 285.

The Walrus, Morsè, or Sea-Horse, an animal which inhabits the arctic regions of both continents, very seldom visits the coasts of Britain, among the Mammalia of which country it can rank only as an accidental straggler. It recals the idea of an overgrown Seal, and attains a very large size, individuals measuring twelve feet or more in length, with a girth proportionally greater than is usually observed in other members of this family. The head is of moderate size, of a square form when viewed from before, being deep and bulging in front, to afford a suitable insertion to the enormous tusks; the upper lip large, tumid, and divided into two lobes; the mouth rather small, as are the nostrils and eyes; the orifices of the ears very small, without auricles.

The neck is very short, the body extremely bulky, rounded, of nearly equal diameter for half its length, and tapering to the scarcely distinct blunt tail. The fore feet are very short, the toes connected by the skin, which extends beyond the extremely small claws; the hind feet larger, fan-shaped when expanded, with larger claws, beyond which the skin is still farther extended. The entire skin, excepting the soles and the interdigital membranes, is covered with short, stiff, adpressed hair, of a yellowish very light-grey colour. On the lower part of the face the hairs are very short, on the edges of the lips woolly, and of a reddish tinge. On each side of the upper lip are twelve rows of short, blunt, horny flattened bristles.

The normal dentition of the Walrus is shown by the skull of a young individual in the Museum of the Edinburgh College of Surgeons. In the upper jaw there are on each side three incisors, the first or inner extremely small, the second a little larger, the third or outer disproportionately large, being equal to the largest grinders. The socket of this tooth is placed in the intermaxillary bone, but towards its mouth it is partly formed by the maxillary. The small incisors have deep conical sockets. The canine tooth is displaced, being thrust outwards beyond the line of the other teeth, and causing the peculiar bulging of the head. The lateral incisor is on the level of its anterior margin, and the first grinder is opposite to its middle. There are five grinders, having conical obtuse sockets, and conse-

quently single roots; the first smaller than the last incisor, the second and third largest, the fourth much smaller, the fifth very small, all shortly conical, and blunt, with enamel on the tip only. The canine tooth is also at first enamelled at its extremity. In the lower jaw are two very small conical incisors on each side; the canine tooth is wanting; five grinders, with single conical compressed roots, and short compressed conical crowns, enamelled at the point; the first, second, and third nearly equal, the latter being a little larger, the fourth much smaller, and the fifth very small. The tusks, or enormously developed canine teeth of the upper jaw, are compressed, conical, a little curved backward, directed downwards and a little forwards, and somewhat diverging, but in some individuals, when very long, they again converge toward the points. In adults, the incisors are obliterated, excepting the lateral pair of the upper jaw; the fifth grinder in both jaws has also disappeared, and sometimes the fourth in one or both jaws. A circumstance that seems to me very singular, and for which I cannot account, is, that although the grinders are so placed as to meet at the points only, the outer surface of the lower not falling within the line of the upper so as to meet their inner surface, nor the reverse, in any possible case, the jaw having no lateral motion, which is rendered impossible both by its articulation and by the barriers formed by the tusks, yet the *inner* surface of *both* upper and lower grinders is obliquely worn, in old individuals in a very remark-

able degree, and more or less in younger. Sometimes the grinders are, moreover, flattened at the points, and frequently they are worn obliquely down to the level of the jaw. The mastication of fuci, on which it has been alleged that the Walrus feeds, could hardly produce these effects.

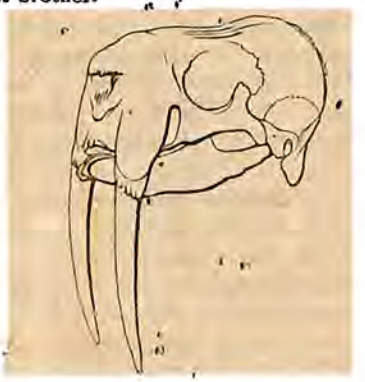
In the Walrus the teeth are thus similar in number to those of the Seals, with the exception of the lower canines, which are deficient. The incisors have been differently represented by all authors, probably because they have not had an opportunity of examining the skull of a sufficiently young individual.

The Walrus is generally supposed to live on fishes, like the Seals; but Mr Bell is of opinion that "the small number of grinding teeth, and more especially their extreme shortness and rounded form, are calculated rather to bruise the half pulpy mass of marine vegetables than to hold and pierce the slippery hardness of the fish's scaly cuirass;" and refers in corroboration of this idea to Mr Fisher's having seen in the stomach of one the "long branches of sea-weeds, *Fucus digitatus*." Several cetaceous animals, however, of which the teeth become nearly as much flattened as those of the Walrus, live on fish. To the inhabitants of the Northern regions this animal is of great importance, as it supplies them with food, oil for their lamps, and a covering for their huts and canoes. Great numbers were formerly killed by the whale-fishers, for the sake of their blubber or subcutaneous fat

and their tusks, which yield ivory of the best quality; but of late whether on account of the diminution of their numbers, or their having betaken themselves to less accessible tracts, they are seldom obtained. They repose on the ice or on rocks, associating in droves, and are of a peaceable disposition, neither molesting other animals, nor given to quarrel among themselves.

Whether this animal formerly frequented our Northern coasts cannot now be ascertained; and I am not aware of its occurrence of late years in more than two instances. An individual is stated to have been killed in Orkney in June 1825; and in December 1817 another was shot as it reposed on a rock at Caolas Stocnis, in the island of Harris. This individual I had the fortune to see, but not until after it had been mutilated. It was about ten feet in length, and yielded two barrels of blubber. The head measured from the occiput direct to the most prominent part of the nose 13½ inches, its breadth four inches above the eyes 8½, between the eyes 8; the distance from the nose to the mouth 5½; the nostrils ovate, and separated by a thin septum; the eyes 1¼ in diameter. In the upper jaw were four teeth on each side, and the same number in the lower, all very short, and slightly rounded. The two large canine teeth measured from their insertion in the gum to the apex 8½, the breadth of the mouth between them 3½, the distance between their points 6¼. The ears were four inches behind the eyes. The tongue was of a triangular form, to correspond with the roof of the mouth. The skin

was about half an inch thick, covered with very short, thin, greyish or dull-white hairs. The bristles on the upper lip diminished in length from the angle of the mouth to the middle, the largest nearly five inches long, and as thick as a thrush's quill. A notice respecting this animal was inserted in the second volume of the Edinburgh Philosophical Journal, being my first contribution to Science. The skull was sent to Mr Macleod, the proprietor of the island, who allowed it to be broken to pieces, and the tusks I subsequently saw in his possession in Edinburgh. The occurrence of so rare an animal caused great astonishment at the time, and the courage of the person who ventured to shoot it was highly extolled. It formed the subject of many a conversation over the whole district; and its ghost appeared to a young woman in a dream, stating that it had visited their inhospitable coast in search of a lost brother.



RODENTIA

OR

GNAWING QUADRUPEDS.

THE animals, generally of small size, and almost always phytophagous, which collectively have received the names of *Glires* and *Rodentia*, are readily distinguishable from all others by their peculiar dentition. They have two large incisors in each jaw, between which and the grinders is an empty space, there being no canine teeth. The front teeth are of a prismatic form, chisel-shaped at the end, continually grow from the root or base, in proportion as they are worn; and should one happen to be displaced, the corresponding tooth of the other jaw, finding no obstacle to its growth, attains a great elongation. The lower jaw being articulated by a longitudinal condyle, has a horizontal motion backwards and forwards, and the flat crowns of the grinders are marked with transverse

plates of enamel, to correspond with this motion. But although these teeth are generally flat with linear plates of enamel, they are sometimes marked with blunt tubercles, and more rarely with sharp points. In the first case the animals are strictly frugivorous, in the last occasionally carnivorous, and in the other omnivorous. The stomach is simple, the intestine very long, the cœcum of great size, often exceeding that of the stomach. These animals are generally extremely active and lively, and in all of them the posterior extremities are proportionally more developed than the anterior, so that they advance by a series of leaps, rather than by walking or running. Such of them as are furnished with perfect clavicles, are capable of raising objects between their fore feet, and often of climbing upon trees. The Rodentia may be divided into several families: The Sciuridæ, or Squirrels; Muridæ, or Rats and Mice; Castoridæ, or Beavers and allied genera; Leporidæ, or Hares; and several others, which it is unnecessary to enumerate, as they have no representatives among our indigenous quadrupeds. The British species, fourteen in number, belong to five genera:—

1. SCIURUS. SQUIRREL. Perfect clavicles; grinders simple, that is, composed of enamel and ivory only, five above, and four below on each side, their summits tubercular; upper incisors chisel-shaped, lower pointed; tail long, bushy, with the hairs directed laterally.

1. *Sc. vulgaris.*—Common or Red Squirrel.

II. MYOXUS. DORMOUSE. Perfect clavicles; grinders simple, four above, and four below on each side, the summits flat; tail long, covered with rather long hairs directed laterally.

1. *M. avellanarius.*—Common Dormouse.

III. MUS. MOUSE or RAT. Perfect clavicles; grinders simple, three above, and three below on each side, their summits tubercular; upper incisors chisel-shaped, lower compressed and pointed; tail long, tapering, annulated with scales, and nearly bare.

1. *M. Rattus.*—Black Rat.
2. *M. decumanus.*—Brown Rat.
3. *M. domesticus.*—Common Mouse.
4. *M. sylvaticus.*—Field Mouse.
5. *M. messorius.*—Harvest Mouse.

IV. ARVICOLA. VOLE. Perfect clavicles; grinders simple, three above, and three below on each side, deeply grooved externally; incisors very long; muzzle obtuse; toes separate; tail shorter than the body, round, annulated with scales, but hairy.

1. *A. amphibius.*—Water Vole.
2. *A. agrestis.*—Field Vole.
3. *A. pratensis.*—Bank Vole.

V. LEPUS. HARE or RABBIT. Clavicles incomplete; grinders simple, with flat summits, six above,

and five below on each side; incisors grooved; two supplementary or smaller behind those of the upper jaw; ears very long; tail very short, and recurved.

1. *L. timidus.*—Common Hare.
2. *L. Hibernicus.*—Irish Hare.
3. *L. variabilis.*—White or Changing Hare.
4. *L. Cuniculus.*—Rabbit.

THE RED OR COMMON SQUIRREL.

Sciurus vulgaris.—Linn.

PLATE XXI.

Brownish-red, minutely mottled with grey above, white beneath; ears tufted; tail very bushy, brownish-red, the hairs distichous beneath; feet light-red.

Sciurus vulgaris. Linn. Syst. Nat. I. 86; Desmar. Mammal 330; Jenyns, Brit. Vert. Anim. 29; Bell, Brit. Quadr. 291.

The Red Squirrel, the only species of this extensive genus found in Britain, is one of the most beautiful and lively of our indigenous quadrupeds. Its form is compact, its body being of moderate length, rather full, with the back usually arched; the neck short and thick; the head of moderate size, with the fore part flattened, the nose prominent, the lips broad; the ears of moderate size; the eyes large and prominent; the anterior limbs of ordinary length, and muscular, with four slender

toes, furnished with large, arched, much compressed, acute claws, and a rudimentary inner toe reduced to a mere knob; the hind limbs proportionally longer, with five toes, and similar but shorter claws; the tail nearly as long as the body and head. On the fore feet the lateral toes are nearly equal, and much shorter than the middle toes, which are also equal. On the hind feet, the first toe is very short, the second longer than the fifth, the third and fourth longest, and about equal. The incisors of the upper jaw are rather short and chisel-shaped; those of the lower much longer, narrower, and pointed. There are five grinders in the upper, and four in the lower jaw, on each side. The œsophagus is 4¼ inches long; the stomach membranous, of a broadly ovate form, its greatest diameter 2½ inches; the pylorus three-fourths of an inch distant from the cardia. The intestine, from the pylorus to the cœcum, measures three feet eleven inches, its average diameter being 3½ twelfths; beyond the cœcum one foot ten inches, its diameter ½ inch. The head of the colon is greatly enlarged so as to resemble a second stomach, 2¾ inches long, its greatest transverse diameter 1¼. When the fur is complete in autumn, it is rather long, dense, and soft, the ears fringed at the end with longish hairs; the tail bushy. The general colour of the upper parts is brownish-red, minutely dotted with yellowish-grey, the hairs being marked with brown, and whitish; the tail of a darker brown, with a very small portion of the tip whitish; the lower parts pure white; the feet, and

a band along the side, light-red. The mystachial bristles dark-brown.

	Inches.	Lines.
Length to end of tail	9	0
Length of head	2	2
Length of neck and body	6	10
Length of tail to end of hair	8	0

The female is smaller, and generally of a lighter colour. In two individuals examined, the intestinal canal was much shorter than that of the male mentioned above; the œsophagus in one being four inches long; the intestine to the cœcum two feet nine inches; the cœcum two inches; the rest of the intestine nine inches. Of this individual the length was fifteen inches, that of the tail being seven.

In younger individuals the colour is redder than in adults, in which it is seldom destitute of a grey tinge, owing to the minute markings above described; and I have seen some in which the grey predominated over the red. In April and May, the hair of the upper parts assumes a singularly faded appearance, losing its gloss, and assuming a light-yellowish tint. In the latter month the process of depilation commences, to be completed by the end of June, when the ears are destitute of tufts. It appears that the long hairs which fringe the ears are not proportionally longer than the rest until November, that they then gradually elongate, attain their extreme development in spring, and remain

unshed until June. In the northern regions of Europe, the grey colour in winter is more decided, and the fur of denser and finer texture.

The agility of the Squirrel, its lively disposition, and beautiful form, render it a general favourite. It is amusing to watch it in its arboreal excursions, when you see it ascending the trunk and branches with surprising speed, running out even on slender twigs, always when in motion keeping its tail depressed, occasionally performing leaps from one branch to another, and when alarmed scampering away at such a rate that you almost expect to see it miss its footing and fall down headlong. It feeds on nuts, beech-mast, acorns, buds, and the bark of young branches; generally, while eating, sitting on its haunches, with its tail elevated, holding the object between its paws, and dexterously unshelling the kernel, from which it even removes the outer pellicle before munching it. It does not reside entirely on trees, but frequently resorts to the ground, where it moves with nearly equal agility, leaping like a rabbit. The female produces three or four young ones about midsummer, which are deposited in a nest, formed of moss, fibrous roots, grass and leaves, curiously interwoven, and placed in a hole, or in the fork between two large branches.

In autumn it lays up a store of provisions for winter, but usually in an irregular manner, depositing nuts in different places in the ground, and in holes of trees. When the cold weather commences, it becomes less active, and often dozes for days in

its retreat; but it does not become completely torpid; and I have seen it abroad in the midst of a most severe snow storm. If the weather be comparatively mild, it exhibits its usual activity, feeding on bark and twigs.

The Squirrel may be domesticated if taken young, and becomes an agreeable, playful, and gentle pet. It is generally distributed in the wooded parts of the country; but in many districts, especially in Scotland, is of rare occurrence. To the south of the Frith of Forth and Clyde, it is not uncommon in parks and plantations; in the extensive tract lying eastward of the Grampians, and in some of the valleys of those mountains, it is not less frequent; but in the northern districts it appears to be unknown.

THE DORMOUSE.

Myoxus avellanarius.—Desmar.

PLATE XXII.

Upper parts light yellowish-red, lower paler; tail as long as the body, flattened, with the hairs distichous.

Mus avellanarius. Linn. Syst. Nat. I.; Sciurus avellanarius, Erxleb. Syst. 433; Myoxus avellanarius, Desmar. Mammal. 295; Jenyns, Brit. Vert. Anim. 30; Bell, Brit. Quadr. 295.

This beautiful little animal is very intimately allied to the Squirrels, among which it has been placed by several authors, but from which it differs chiefly in wanting the anterior small grinder in the upper jaw, in having the tail less bushy, and the hind legs less elongated. It is also said, like the other species referred to the same genus, to have no cœcum, nor any enlargement of the colon. Its form is compact and full; the neck short; the head rather large, the nose prominent, the eyes of moderate size, the ears rather short, and broadly rounded; the feet of delicate structure, the anterior with four

THE DORMOUSE.

toes, and a rudimentary inner toe, the posterior with five; the claws small, compressed, acute; the tail long. The mystachial bristles are large; the fur very soft and dense; the hair on the tail longish, and inclined in two directions. The general colour is light yellowish-red, gradually becoming paler beneath, the fore part of the neck nearly white; the tail dull-red.

	Inches.	Lines.
Length to end of tail	5	3
Length of the head	0	10
Length of the tail	2	6

In its habits the Dormouse resembles the Squirrel, inasmuch as it climbs with facility, and exhibits great liveliness and agility; but it is also allied to the Mice, and passes a great part of its time on the ground, feeding on grass, corn, and various small fruits. It resides in thickets, generally remote from human habitations, placing its nest in bushes, and forming it of grass and leaves, intricately interlaced, and disposed in a roundish form, with a narrow aperture at the top. Having laid up a store of food, and, like other hibernating animals, having become very fat towards the end of autumn, it betakes itself to its retreat, and rolling itself up into a ball, falls into a state of torpidity, from which it is now and then aroused by an unusually mild day, when it partakes of its provision, and relapses into its usual condition. The young are of a brownish-grey colour, four or five in number. This species,

although common in many parts of England, has not hitherto been satisfactorily proved to exist in Scotland, although it has been reported to me to occur near Gifford in East Lothian. In the third volume of the Naturalist, at p. 104, Mr Salmon gives the following account of an individual which he happened to capture on the 16th December 1837: "As I was pushing my way amidst the briers and brambles, I chanced to stumble upon an interesting incident in the shape of a little ball of grass curiously interwoven, lying on the ground. It was about eight inches in circumference, and on taking it up I soon ascertained, by the faint sound emitted from the interior, on my handling it, that it contained a prisoner. I bore my prize homeward for examination, and on making a slight opening, immediately issued forth one of those beautiful little creatures the Dormouse. The heat of my hand and the warmth of the room had completely revived it from its torpor; it appeared to enjoy its transition by nimbly scaling every part of the furniture in all directions. It experienced no difficulty in either ascending or descending the polished backs of the chairs, and when I attempted to secure it, it leaped from chair to chair with astonishing agility for so small a creature. On taking it into my hand, it showed not the least disposition to resent the liberty; on the contrary, it was very docile. On being set at liberty it sprang at least two yards on to a table. I was much gratified on witnessing its agile movements. In the evening I placed my little stranger

with its original domicile in a box, of which on the following morning I found it had taken possession, and again relapsed into a state of torpidity, in which condition I transferred my unconscious *sleeper* to a friend." At p. 377 of the same volume, Mr Piggot, Stoke Ferry, Norfolk, states that it came to him from Sussex on the 23d December, "a distance of 140 miles, apparently but little disturbed by the long and tedious ride. From that time, till the 1st of April 1838, it slept in its snug dormitory, a deal box lined with wool, when it awoke, and readily ate of apples and nuts. It is easily alarmed, being more timid than tame, but shows no signs of anger on being taken in the hand. As it sleeps the greater part of the day, I cannot then closely watch its habits; but towards evening it wakes up, and is very lively and frolicsome, running, on being let out of its cage, up the bell rope, where it will sit for hours in the folds of the knot, timidly watching our movements."

THE BLACK RAT.

Mus Rattus.—Linn.

PLATE XXIII.

Greyish-black above, blackish-grey beneath; ears about half the length of the head; tail rather longer than the head and body.

Mus Rattus. Linn. Syst. Nat. I. 83; Desmar. Mammal. 300, Jenyns, Brit. Vert. Anim. 32; Bell, Brit. Quadr. 311.

The Black Rat, which was formerly very abundant in Britain, is now extremely rare, insomuch that specimens for examination cannot be procured without much difficulty. The Rev. Mr Gordon, minister of Birnie, some years ago sent me several individuals alive, which were caught in Elgin, where, however, the species is much less frequently met with than the Brown Rat. In Keith, which is at a greater distance from the coast, it is not very uncommon; and in other inland towns and villages in Scotland, it is still to be procured. In Edinburgh it appears to be completely extirpated

THE BLACK RAT.

as I have not seen a specimen obtained there within these fifteen years; but in London it is said by Mr Bell to exist in considerable numbers, "especially in the cellars and stables, in many of which it is more common than the other." Whether the destruction of this animal has been effected by the larger and more ferocious Brown Rat, or, like that of many tribes of the human species, has resulted from the diminution of food, caused by the overwhelming increase of an unfriendly race, it is impossible to determine. It has indeed been alleged by many naturalists that the Brown Rat has actually worried to death its less powerful relative; and, although this is mere conjecture, it is by no means improbable, if we consider the character of that audacious animal, which has been known, when hard pressed, to attack even one of the lords of creation, when unusually hungry to gnaw the flesh of his defenceless offspring, and, when famished, to kill and devour its own kind.

The "old English or Black Rat," as it has been called, although as much French or Irish as English, is an active, lively, most cleanly, and, I think, beautiful, little quadruped. Its elongated muzzle, however, and its bare, rope-like, scaly tail, detract from its beauty. It is naturally phytophagous, feeding chiefly on herbs and seeds, but in consequence of its preferring the vicinity of man, it finds it necessary to adopt an extended regimen, and convert into chyle whatever esculents come in its way, so that it is scarcely less omnivorous than its un-

willing patron. Unless in places where it is not liable to molestation it feeds by night, remaining concealed by day in its burrows or runs. It produces six or eight at a birth, and litters several times in the year, depositing its blind and naked young in a nest composed of dry grass, or any soft materials easily produced.

It is believed to have been originally imported from the Continent, where it first made its appearance in the beginning of the sixteenth century, and is supposed to have come from the East. Vessels in port were formerly liable to be infested by it, so that it soon became as common in America as in Europe; although in the maritime parts of that country it has now become nearly as scarce as with us, and from the same cause, the predominance of the more enterprising and stronger Brown Rat.

In feeding, this species holds the object, if small, between its fore feet, sits on its haunches with the body bent forward, and the back arched, while its tail is curved along the ground. It runs with great agility, and exhibits much liveliness in all its actions; is remarkably cleanly, taking care to remove whatever may happen to adhere to its fur, feet, or head; and, although occasionally quarrelsome, it for the most part lives a peaceful life in its own community. In affectionate concern for its young, it is not surpassed by any other animal, and were it not an unwelcome guest in our dwellings and stores, but confined itself to the woods and pastures, we should place it among the most interesting of our

native quadrupeds. Its voracity, however, the ravages which it makes among our corn and provisions, and its prolificacy, render it injurious, and therefore hateful. A feast such it was when it abounded in the country, but in Britain its career is to appearance nearly ended, and the place of this species is supplied by another, more powerful and destructive, the Brown Rat.

In the days of its prosperity, when that species had not yet molested it, we find it represented as extremely numerous in the more temperate countries of Europe. "The Rat," says Buffon, "is omnivorous; it eats fruit, gnaws wool, cotton, linen, clothes, and furniture, pierces wood, makes holes in the walls, lodges under the floors, in the vacuities of the timber-work, and of the wainscot. It comes forth only to look for food, and often carries to its retreats whatever it can drag thither, sometimes laying up a store of provisions, especially when it has young. In all places at all times, its depredations and ravages are felt: having an appetite for every thing, its voracity is even tempted by human flesh; dying persons, prisoners, children in the cradle, have been gnawn by this omnivorous quadruped. Sewers, hospitals, unclean places, and granaries, are its favourite retreats. It seeks warm places, and in winter nestles near chimneys, or in hay or straw. During this season it lives on fat, candles, lard, cheese, walnuts, paper, and drinks its urine. The loss which it occasions is not always trifling: it seems to this animal that all nature owes a tribute

to every individual of its species; the Rats, in plac. of assisting each other, and dividing their booty in peace, according to their wants, occupy themselves in mutilating, robbing, and devouring one another." He continues in the same strain, presenting a most alarming picture of the ravages of this little creature, which certainly owes no debt of gratitude to the loquacious and exaggerating Count. Rats are bad enough naturally, to render it unnecessary to enhance their evil qualities. Whatever in them is most displeasing to us, however, is found in still greater perfection in the species which comes next to be described.

THE BROWN RAT.

Mus decumanus.—Pall.

PLATE XXIV.

Greyish-brown above, greyish-white beneath; ears about a third of the length of the head; tail shorter than the head and body.

Mus decumanus, Gmel. Linn. Syst. Nat. I. 127; Desmar. Mammal. 473; Jenyns, Brit. Vert. Anim. 32; Bell, Brit. Quadr. 315.

The Brown Rat, although not originally a native of Britain, is generally dispersed there, being met with from one extremity of the island to the other. It is supposed to have been introduced from Persia and the East Indies about 1730, and gradually to have spread over the greater part of the continent of Europe, as well as America, by means of the frequent commercial intercourse established among the nations of these regions. It is larger and more powerful than the Black Rat, which it resembles in

form and habits, being equally an unwelcome parasite of man, and finding an asylum in his habitations and store-houses. In cities it frequently inhabits in great numbers the drains and sewers, whence it makes its way into the houses; in maritime towns, it often takes up its abode in the quays, among piles of wood, in buildings along the shores, or wherever it finds a secure retreat. But it is not confined to cities and villages, but establishes colonies in farm-steadings, on the banks of canals and rivers, and even in islands at a considerable distance from the mainland, or from larger islands to which it has been introduced by shipping. Thus, on many of the islets of the Hebrides it is found in considerable numbers, feeding on grass, shell-fish, and crustacea, and burrowing in the banks; for although not essentially amphibious, like the Water-Rat, it does not hesitate on occasion to betake itself to the water, and flocks have been seen swimming from one island to another.

It is a very cleanly animal, for even when its residence is in a ditch or sewer in the midst of all sorts of filth, it almost invariably preserves itself from pollution; and in parts remote from towns its fur is often possessed of considerable beauty, although, on account of the injury it inflicts upon us, and the abhorrence with which in childhood we are taught to regard it, few persons will be apt to discover much beauty in a Rat. Its food consists of almost every kind of animal and vegetable substance eaten by other quadrupeds. In granaries and corn-

yards it is extremely destructive, committing its depredations in the former by night, and in the latter feasting at leisure in the heart of the stacks, where it produces its young, and whence it cannot be expelled until they are taken down, when the quantity of grain which it has destroyed is sometimes found to be enormous. In houses it feeds on bread, potatoes, suet, tallow, flesh, fish, cheese, butter, in short, almost every thing that comes in its way, including leather and articles of apparel. It gnaws its way through planks, partitions, and chests; burrows with facility under the floors and walls; nestles behind the plaster, or in the roofs; and, when numerous, becomes a source of perpetual annoyance. In the poultry-yard it sometimes destroys the young chickens, and sucks the eggs; and in game preserves occasionally commits similar depredations. Instances of its mutilating infants, and even of its attacking grown persons, are known, and, when hard pushed, it will sometimes turn on a dog or cat, and defend itself with great vigour. In the fields it devours great quantities of corn, beans, pease, and other articles of agricultural produce; and, as it is extremely prolific, it often inflicts serious injury. When provisions fall short, it migrates, sometimes in large bodies, to a more favourable station, and when settled in a place where its supply of food is ample, it rapidly increases to an astonishing extent.

To counterbalance the effects of its destructive habits, the Rat possesses no quality rendering it in

any degree useful to man. Its flesh is not eaten by him, although it is probably good; it is not of service in destroying animals that are injurious, and its fur is not applied to any useful purpose. It is therefore everywhere proscribed, and various expedients are used for its destruction. It is poisoned with arsenic and other substances, caught in traps, hunted by cats and terriers; and yet, in spite of every effort to extirpate it, it not only maintains its footing, but appears to be yearly increasing; for its sagacity is great, and the cunning which it employs to elude its enemies often preserves it from destruction.

Although naturally frugivorous, it accommodates itself to circumstances, living on the sea-shore on mollusca, crustacea, and fishes; in the fields on roots, herbage, and seeds. "The Brown Rats," says M. Milne Edwards, "are very carnivorous; those which in small numbers reside in the country attack young animals, and those that infest the towns feed chiefly on carrion. In Paris they are very common in the sewers situated near the markets and slaughter-houses, the public latrines, the boyauderies, and especially the slaughtering establishment of Montfaucon, where, towards evening, they are seen covering the carcases of the horses that have been killed through the day." In Jesse's Gleanings of Natural History, it is stated that in a report made to the Government with reference to the removal of this establishment to a greater distance from Paris, "one of the chief obstacles urged against such a removal was the fear entertained of

the dangerous consequences that might result to the neighbourhood from suddenly depriving these voracious vermin of their accustomed sustenance." The report goes on to state that the carcases of the horses killed in the course of a day (and sometimes these amounted to thirty-five) are found the next morning picked bare to the bone. Dusaussois has, however, made a still more conclusive experiment. A part of his establishment is enclosed by solid walls, at the foot of which are several holes made for the ingress and egress of the Rats. Into this enclosure he put the carcases of two or three horses; and, towards the middle of the night, having first cautiously, and with as little noise as possible, stopped up all the holes, he got together several of his workmen, each having a torch in one hand and a stick in the other. Having entered the yard and closed the door behind them, they commenced a general massacre. It was not necessary to take any aim, for no matter how the blow was directed, it was sure to immolate a Rat; and those which endeavoured to escape by climbing up the walls were quickly knocked down. By a repetition of this experiment, at intervals of a few days, he killed in the space of a month 16,050 Rats. After one night's massacre the dead amounted to 2650, and the result of four hunts was 9101. Even this can give but an imperfect idea of the number of these vermin; for the enclosure in which they were thus killed contains not above the twentieth part of the space over which the dead bodies of horses are

spread, and which, it is but fair to suppose, must equally attract the Rats upon all points. These animals have made burrows for themselves, like rabbits, in the adjoining fields, and hollowed out into catacombs all the surrounding eminences, and that to such an extent, that it is not unusual to see the latter crumble away at the base, and leave these subterraneous works exposed.

The Brown Rat is the largest species of the genus that occurs with us. Its body is rather elongated and full; the limbs short and moderately strong, the neck short, the head of moderate size, compressed, and rather pointed; the ears short and rounded, the tail long, slender, tapering to a point, and covered with 200 rows of scales. On the fore feet are four toes, of which the two middle are considerably longer; the soles are bare, and have five prominent papillæ. The hind feet have five toes, of which the three middle are largest, and nearly equal, the first shorter than the fifth; the sole is bare up to the heel, and has six papillæ. The general colour of the upper parts is reddish-brown; the long hairs are black at the end; the lower parts greyish-white. On the feet the hairs, which are very short, are whitish and glistening; the claws are horn-coloured or greyish-yellow. The œsophagus is four inches long; the stomach transversely oblong, $2\frac{1}{2}$ inches in length; the intestine slender, about $2\frac{1}{2}$ twelfths in diameter for four feet three inches; it then enters a large curved sac formed by the head of the colon, which projects two inches,

with a diameter of nine-twelfths. From thence to its extremity, the intestine measures ten inches, its diameter at first seven-twelfths, but gradually diminishing to four-twelfths. The liver is divided into six lobes, and there is no gall-bladder. In the female there are six pectoral, and six inguino-ventral mammæ.

	Male.	Female.
Length to end of tail	19	16 inches.
—— of head	2¾	2¼
—— tail	8¼	7¼
—— ears	¾	¾
—— hind foot	1¾	1½

Albinoes, pure white, or more frequently yellowish-white, with pink eyes, are sometimes met with, as are individuals patched with that colour.

THE DOMESTIC MOUSE.

Mus Musculus.—Linn.

PLATE XXV.

Ears about half the length of the head; tail a little shorter than the head and body; general colour of the upper parts greyish-brown, of the lower yellowish-grey.

Mus Musculus. Linn. Syst. Nat. I. 83; Desmar. Mammal. 301; Jenyns, Brit. Vert. Anim. 31; Bell, Brit. Quadr. 308.

From the Rats to the Domestic Mouse the transition is rather abrupt, if we look to the size of these animals, but not so if we have regard to form, for the Mouse is but a small edition of the Rat, although its head is proportionally less elongated than that of the black species. Its body is moderately full, its neck short, its head tapering, with the muzzle rather pointed, its eyes prominent and of moderate size, its ears very broad and rounded. The legs are short, the feet delicate, the tail about a sixth part shorter than the head and body. The mystachial bristles are numerous, very long, and slender; the

pile very soft, and of moderate length; the tail covered with short stiff hairs. The general colour of the upper parts is greyish-brown, intermixed with yellowish-brown, of the lower light yellowish-grey; the feet whitish, the tail dusky. The œsophagus is an inch long; the stomach large, its greatest diameter nine-twelfths; the intestine 15½ inches to the cœcum, beyond it four inches; the cœcum an inch and a half long, with a diameter of three-twelfths.

	Inches.	Lines.
Length to end of tail	6½	0
——— of tail	3	0
——— head	0	11
——— ears	0	5

The colours vary considerably, some individuals being much darker; others with white hairs interspersed. Individuals obtained in the fields are sometimes almost as beautifully coloured as the Wood Mouse; there being much yellowish-brown on their upper parts, and their lower being of a dull cream-colour. Albinoes of a yellowish-white colour, with pink eyes, sometimes occur, and a variety of this kind, which is propagated unchanged, is kept as a pet. A more beautiful variety, which some, however, consider as a distinct species, with much softer fur, and of a white colour patched with black, also propagates in confinement, is extremely gentle, and will run over the person of its patron, and eat from his hand. These pets often devour their young, and are of very delicate constitution.

The Domestic Mouse, although dusky coloured, is a very beautifully formed little animal, extremely active and interesting in its manners. It is pleasant to sit quietly at midnight, watching one which has ventured forth from its retreat, and stolen to the hearth in quest of crumbs. It glides along, now slowly, now by sudden starts, and on finding some fragment of food, sits on its haunches, lays hold of it in its fore feet, and raising it up, nibbles it, or, if apprehensive of danger, runs off with it to its hole. Although extremely timid, Mice sometimes exhibit considerable boldness, and venture quite close to a person who does not molest them. Their agility is astonishing, and to escape when pursued, they perform extraordinary feats. I have seen one leap from the top of a stair-case upon a table, a distance of twelve feet, apparently without receiving any injury. If seized in the hand, they bite severely; but if caught by the tail and thus suspended, are unable to turn upon their persecutor. Although when in small numbers they are scarcely injurious in a house, yet, owing to their fecundity, they soon become very destructive, devouring meal, flour, bread, cheese, butter, tallow, in short, almost every article of food that comes in their way, and often gnawing clothes, leather, and furniture. Their great enemy, the Cat, is not always able to extirpate them, so that the additional aid of traps and poison is required. The ravages of this species are not confined to houses, for it often betakes itself to the fields, and nestles in the corn-stacks, which are

found toward the base traversed by its tortuous runs. The ground beneath is also filled with them, and on removing a stack, numbers almost incredible are sometimes met with. Besides Man, and his allies the Cat, the Dog, and the Ferret, the Mouse has many powerful enemies, as the Weasel, Owls of various species, the Kestrel and other Hawks, all of which, however, are unable to extirpate it, for it litters many times in the year, producing from five to seven at a birth, and thus in favourable localities soon increases to a great extent. Its nest is composed of straw, hay, woollen cloth, linen, and other substances, generally gnawed into small fragments; and the young are at first blind and naked, but grow so rapidly that in a fortnight they are able to shift for themselves.

This species is generally distributed, occurring in human habitations, and their vicinity, in the most remote and thinly peopled districts. But it appears to be entirely dependant on Man, and is not found to form colonies remote from his dwellings, like the other species. It is said to occur in all parts of the world, but its native country is unknown, for with us it appears to be a naturalized and not a naturally indigenous animal.

THE WOOD MOUSE, OR LONG-TAILED FIELD MOUSE.

Mus sylvaticus.—Linn.

PLATE XXVI.

Ears scarcely half the length of the head; tail nearly as long as the head and body; upper parts reddish-brown, lower greyish-white, with a light yellowish-red spot on the breast.

Mus sylvaticus. Linn. Syst. Nat. I. 84. Desmar. Mammal. 301; Jenyns, Brit. Vert. Anim. 30; Bell, Brit. Quadr. 305.

This very beautiful little creature is generally distributed in Britain, residing not so much in woods, as its name implies, as in thickets, hedges, cornfields, and gardens. It resembles the Domestic Mouse in form, and is nearly of the same size, but is easily distinguished by its reddish colour, and its more elongated tail. Its body is moderately full, its head oblong and obtuse, its eyes rather large and prominent, its ears broad and rounded, its tail very elongated. The limbs are rather short, the

Stewart del.

Lizars

THE FIELD MOUSE.

feet delicate; the pollex of the fore foot is reduced to a mere knob, the third toe longest, the fourth nearly as long, the second much longer than the fifth or outer. Of the five toes of the hind foot, the three middle are nearly equal, and much longer, the first shorter than the fifth. The general colour of the upper parts is reddish-brown, mixed with blackish hairs; of the lower parts white, the colours meeting abruptly on the sides. There is a yellowish spot on the breast, between the fore legs; and the lower surface of the tail is white. The stomach is elliptical, eight-twelfths long, the intestine, which is singularly delicate and diaphanous, is twenty inches in length; the cœcum enlarged to about double the thickness of the rest, being three-twelfths in diameter. Three individuals present the following dimensions:—

	In.	Lines.	In.	Lines.	In.	Lines.
Length to end of tail	6	8	6	6	6	0
——— of head	1	2	1	2	1	2
——— ear	0	6	0	6	0	6
——— tail	3	3	3	0	2	9

Individuals differ considerably in colour, some being brownish-red, or light yellowish-red, above, with the lower parts nearly pure white, others of a duller tint above, and greyish beneath.

The Long-Tailed Field Mouse produces from five to eight at a birth, and is supposed to litter several times in the year. It is in consequence of this prolificacy very abundant in many districts, and frequently commits considerable ravages in the

corn-fields and gardens. Its food consists of seeds, especially those of grasses, acorns, nuts, and insects; and, like the Squirrel, it lays up a store for the winter, depositing great quantities of vegetable substances in its holes, which are formed in banks, or under the roots of trees, or in the open fields. Sometimes it takes possession of the deserted runs or nests of Moles. It does not become torpid in winter; at least I have caught it in the midst of snow, when it had come abroad to search the road for food.

Its more formidable enemies are Kestrels, Owls, Ermines, and Weasels. Although extremely timid, it may be easily tamed. "I have seen," says Mr Bell, "several of them running out on the breakfast table of my late most valued friend Dr Leach, of whose kind and affectionate disposition they appeared to have an almost instinctive perception, as they would feed from his hand, or from his plate, without the least fear, and allow him to handle and play with them as freely as the Dormouse."

THE HARVEST MOUSE.

THE HARVEST MOUSE.

Mus messorius.—Shaw.

PLATE XXVII.

Ears one-third of the length of the head; upper parts light reddish-brown, lower white.

Mus messorius. Shaw, Gen. Zool. II. 62; Desmar. Mammal. 302; Jenyns, Brit. Vert. Anim. 31; Bell, Brit. Quadr. 299.

This beautiful species, the smallest of the mammalia of Great Britain, was first described by White, the celebrated historian of Selborne, who found it in Hampshire. Since then it has been observed in various parts of England, but chiefly in the southern counties; and I have twice obtained a specimen of it in Scotland, one sent to me from Aberdeenshire, the other from the neighbourhood of Edinburgh. Once also I found its nest in Fifeshire; it was

composed of dry blades of coarse grass, arranged in a globular form, and placed in the midst of a tuft of Aira cœspitosa, at the distance of about nine inches from the ground. It contained six or seven naked and blind young ones. The young are said by authors to vary from five to nine; and as it litters several times in the season, it is occasionally numerous in corn-fields, on hedge-banks, and in dry pastures. Its food consists of seeds, especially of corn and grass, insects, and worms. In wheat-stacks it is often found in great abundance, but in general it forms burrows in the ground, in which it probably deposits provisions for the winter. Mr Bingley relates his having fed one with insects, which it always preferred to any other food, and the individual represented in the plate devoured an earth-worm, which at first by twisting round its body upset it. Like the other species, it may be kept in confinement, but is said not to become so familiar as the Wood Mouse.

In form this species resembles the last, but is proportionally more slender, with the head rather larger. The general colour of its upper parts is light reddish-brown, of the lower white, or silvery, these colours meeting abruptly on the sides. Its fur is soft, and rather short, dark-bluish at the base, reddish at the end, with blackish hairs interspersed; the mystachial bristles very long. The ears are broad, rounded, and about a third of the length of the head; the eyes prominent, and black; the feet very delicate; the tail nearly as long as the body

and head, of a dusky colour above, but whitish beneath.

	Inches.	Lines.
Length to end of tail	5	0
——— of head	0	10½
——— ears	0	3½
——— tail	2	5

THE WATER VOLE, OR WATER RAT.

Arvicola amphibius.—DESMAR.

PLATE XXVIII.—Black variety.

Fur pale reddish-brown, mixed with dark-brown hairs above, pale yellowish-brown beneath; tail about half the length of the body and head, slightly compressed towards the end.

Mus amphibius. Linn. Syst. Nat. I. 82; Arvicola amphibius, Desmar. Mammal. 280; Bell, Brit Quadr. 321; Arvicola amphibia, Jenyns, Brit. Vert. Anim. 33.

THE generic name, Vole, applied to the Arvicolæ by Dr Fleming, seems to be preferable to Campagnol, because, although it has no meaning, it gives no erroneous idea of these animals, whereas the latter, besides being descriptively inaccurate, is merely a French word awkwardly introduced, with a pronunciation quite unenglish. The Voles are distinguished from the Mice and Rats by their larger body, broader head, and shorter tail, as well as by their grinders, which, although the same in

Stewart del.
I. Clark sc.
THE BLACK WATER RAT

number, are deeply grooved externally, and have the crown flattened, whereas those of the genus Mus are tuberculate on the crown, and externally smooth.

The Brown Water Vole, commonly named the Water Rat, has the body full, the neck very short, the head short, broad, rounded, and convex above; the limbs small, the tail rather long and slender. The snout is small, as are the nostrils, which are lateral, as well as the eyes. The external ears are short, rounded, entirely concealed in the fur, bare internally, unless at the margin, slightly covered externally with extremely soft hairs; the meatus large, and capable of being exactly closed by a thin angular operculum, having a thickened margin. On the fore foot are five toes, of which the first is very small, the second shorter than the fourth, the third a little longer, the fifth shorter than the second; the claws extremely compressed; the sole bare, with papilliform tubercles opposite the first toe, two smaller behind, a fifth between the bases of the third and fourth toes. On the hind feet also are five toes; the first short, the next three of nearly equal length, the middle toe a little longer, the fifth much shorter; the claws longer and a little stronger; the sole bare to the tarsal joint, with two tubercles at the root of the first toe, one at the root of the second, another at that of the fifth, and one between the third and fourth. The tail is round, slightly tapering, somewhat compressed towards the tip, and covered with short adpressed hairs.

The upper incisors are of moderate size, slightly curved, chisel-shaped, and close together; those of the lower jaw long, curved, subcylindrical, rounded, but laterally sloped. Internally of the mouth, at the commissure of the lips, is a tuft of whitish shining hairs, directed inwards, arising from a whitish callous surface. There are three grinders above and below in a straight very close series, their sides marked with perpendicular ridges and grooves, their surface flat, with a zig-zag appearance.

The palate is tuberculate; the first or anterior tubercle small and trigonal, the second broader, and transversely narrow; the third broader and thicker; the series then divides, and terminates in two smaller very close on each side opposite the first grinder. The stomach is large, divided into two portions by a contraction; the intestine about five feet long; the cœcum of enormous size.

The pile is thick, long, close, silky, composed of two sets of hairs, some being longer and a little thicker; the hair on the feet short, adpressed, and glossy. The general colour of the pile above is dark-brown, or a mixture of blackish-brown, with light reddish-brown; the belly and under parts in general, as well as the sides of the head, light brownish-red. The concealed part of all the hairs is bluish-black, on the lower parts bluish-grey; the tips of the shorter hairs on all parts of the body are reddish-brown; and there being none of the long blackish hairs on the under surface, the colour

is there uniform light-reddish. The teeth are brownish-yellow, the eyes black, the nose dusky, the soles pale flesh-colour, the claws pale yellowish-grey.

The following are the dimensions of a male and a female, in inches and lines:—

	Male.		Female	
Length to end of tail	12	0	12	3
—— of head	1	10	1	10
—— head and body	8	0	8	6
—— tail	4	0	3	9
—— fore foot	0	9	0	9
—— hind foot	1	3	1	3

The Common Water Vole is generally distributed in Britain, but does not occur in many of the northern parts of Scotland. Its residence is in the banks of rivers, brooks, canals, mill-dams, and ponds, in which it forms long and tortuous burrows. It frequently betakes itself to the water, swims and dives with ease, and generally has an entrance to its retreat beneath the surface, so that in cases of danger it may effect its escape without appearing on land. In fine weather, especially in the morning and evening, it may often be seen sitting at the mouth of its hole, nibbling the grass or roots there; but in the middle of the day it usually remains under ground. It feeds entirely on vegetable substances, chiefly roots, and has been known to deposit a store even of potatoes for winter use; for it does not appear to become torpid in the cold season,

although in time of snow it does not come abroad. Five or six young are produced early in summer, and deposited in a nest composed of dry grass and other vegetable matters. This animal never makes its appearance in houses; nor is it injurious to man otherwise than by perforating the banks of canals.

I have seen an albino with yellowish-white hair and pink eyes. But a more interesting variety is that which I have described in the sixth volume of the Transactions of the Wernerian Natural History Society, under the name of *Arvicola ater*. It is very common in some of the northern counties of Scotland, where the Brown Water Vole is seldom seen; but it is also, although rarely, met with in the southern districts, and in various parts of England. At one time I felt pretty confident that this Black Water Rat is specifically distinct from the Common or Brown kind; and even now I do not consider it impossible that it may be so; but the form, structure, proportions, and pile, are so similar, and the skeletons present so little difference, that, until better distinctive characters than I can point out are obtained, it may be well to consider it merely as a variety.

On comparing skulls of both kinds I cannot detect any remarkable difference, excepting such as refer to size, for the Black kind is generally much smaller than the Brown. Some individuals are pure black, but others are blackish-brown, and all intermediate tints are observed until we come to the ordinary colours. In a skeleton of the Black

variety, in the Museum of the Edinburgh College of Surgeons, the number of vertebræ is:—cervical 7; dorsal 13; lumbar 7; sacral 2; caudal 23. The intestinal canal I have generally found longer in the Black than in the Brown variety; but individuals of the same species often exhibit great differences in this respect. On the whole, however, it is just as possible that there may be a Black Water Vole distinct from the Brown, and even from melanite varieties of it, as that we may have a Sea Otter distinct from maritime individuals of the Common Otter; and, therefore, it might be well to examine the subject with more care than has hitherto been bestowed upon it.

THE BROWN OR FIELD VOLE.

Arvicola agrestis.—Flem.

Tail one-third of the length of the head and body; upper parts reddish-brown, the sides lighter; lower parts yellowish-grey.

Mus agrestis. Linn. Fauna Suec. 11. 11; Arvicola vulgaris, Desmar. Mammal. 202; Mus agrestis, Flem. Brit. An. 23; Jenyns, Brit. Vert. An. 33; Bell, Brit. Quadr. 325.

The Brown Field Vole is of a rather robust form, with the head large and anteriorly convex, the body tapering rapidly behind, the ears large, rather prominent, rounded, with a thin prominent antitragal lobe, the nose small and obtuse, the nostrils roundish and lateral. The upper incisors, curved, truncate, chisel-shaped, and extremely sharp, are pale reddish-brown; the lower narrow, tapering to a rounded point, and straw-coloured. The limbs are very small. On the fore foot the inner or second toe is much longer than the outer, the third a little longer than the fourth. On the hind feet the three middle

toes are nearly equal, and the outer is much longer than the inner. The claws are compressed, arched, and acute. On the sole of the fore foot are five prominent knobs, on that of the hind foot six. The fur is long, very soft, rather silky, its concealed part dark blackish-grey. The general colour of the upper parts is reddish-brown, of the sides lighter, of the lower parts yellowish-grey; the claws greyish-white. The tail is very slender, with short stiffish hairs, and terminated by a small tuft of stiff hairs, of which the longest project nearly two-twelfths of an inch. The œsophagus is one inch long; the stomach of an irregular oblong form, contracted in the middle, one inch two-twelfths in its greatest diameter; the intestine to the cœcum $10\frac{1}{2}$ inches, beyond this ten. The cœcum is $5\frac{1}{2}$ inches long, and varies in diameter from three-twelfths to six-twelfths. The female has six pectoral and six inguinal teats. The following are some of the dimensions of a male caught at Roslin, in May 1837, by my son; and of a female sent to me by Mr Hogg from Peebles-shire in the autumn of the same year.

	Male.		Female.	
Length to end of tail	5	3	5	5
—— of head	1	2	1	1
—— body	3	0	3	2
—— tail	1	6	1	2
Ear from base to apex	0	7	0	6
— in the free part behind	0	$4\frac{1}{2}$	0	4

This species frequents meadows, moist pastures, and the banks of rivers, feeding on grass, roots,

and sometimes insects; but is also met with in corn-fields, especially in autumn, as well as in woods and thickets, where it gnaws the bark, sometimes doing much injury to young plantations. It is more rarely met with in the immediate neighbourhood of man than the Wood Mouse, but like that species, it also frequents gardens and orchards. It produces from five to seven or eight young several times in the season, and, under favourable circumstances, increases with astonishing rapidity. The following narrative, by Mr Jesse, will afford an idea of the ravages sometimes committed by Mice, or the smaller species of the genera Arvicola and Mus. "An extraordinary instance of the rapid increase of Mice, and of the injury they sometimes do, occurred a few years ago in the new plantations made by order of the Crown in Dean Forest, Gloucestershire, and in the New Forest, Hampshire. Soon after the formation of these plantations, a sudden and rapid increase of Mice took place in them, which threatened destruction to the whole of the young plants. Vast numbers of these were killed; the Mice having eaten through the roots of five-year old oaks and chestnuts, generally just below the surface of the ground. Hollies also, which were five or six feet high, were barked round the bottom; and in some instances the Mice had crawled up the tree, and were seen feeding on the bark of the upper branches. In the reports made to Government on the subject, it appeared that the roots had been eaten through wherever they obstructed

the runs of the Mice. Various plans were devised for their destruction; traps were set, poison laid, and cats turned out; but nothing appeared to lessen their number. It was at last suggested that if holes were dug, into which the Mice might be enticed or fall, their destruction might be effected. Holes, therefore, were made about twenty yards asunder in some of the Dean Forest plantations, being about twelve in each acre of ground. These holes were from eighteen to twenty inches in depth, and two feet one way by one and a half the other; and they were much wider at the bottom than at the top, being excavated or hollowed under; so that the animal, when once in, could not easily get out again. In these holes at least thirty thousand Mice were caught in the course of three or four months, that number having been counted out, and paid for by the proper officers of the forest. It was, however, calculated that a much greater number than these were taken out of the holes, after being caught, by Stoats, Weasels, Kites, Hawks, and Owls; and also by Crows, Magpies, Jays, &c. The Cats, also, which had been turned out, resorted to these to feed upon the Mice; and, in one instance, a Dog was seen greedily eating them. In addition to the quantity above mentioned, a great many Mice were destroyed in traps, by poison, and by animals and birds of prey; so that in Dean Forest alone, the number of those which were killed in various ways could not be calculated at much less than one hundred thousand. In the New Forest, from the

weekly reports of the deputy-surveyor of the forest, about the same number were destroyed, allowing the same calculation for those eaten by vermin, &c.; in addition to which, it should be mentioned, that these Mice were found to eat each other when their food fell short in winter. Putting these circumstances together, the total destruction of Mice in the two forests in question would probably amount to more than two hundred thousand."

THE RED OR MEADOW VOLE.

Arvicola pratensis.—BAILLON.

PLATE XXIX.

Tail half as long as the head and body; upper parts bright chestnut-red, the sides reddish-grey; lower parts yellowish-white.

Arvicola riparia. Yarrell, Loud. Magaz. Nat. Hist. V. 599; Jenyns, Brit. Vert. Anim. 34; Arvicola pratensis, Baillon in Fr. Cuv. Mamm.; Bell, Brit. Quadr. 330.

THIS species, which is very closely allied to the last, was first discovered in England by Mr Yarrell, whose contributions to zoological science are so numerous and valuable, and described by him in the fifth volume of the Magazine of Natural History, under the name of "Bank Campagnol, *Arvicola riparia*." Mr Bell, however, is of opinion that it is the "*A. pratensis* of M. Baillon, figured in the fourth volume of M. F. Cuvier's great work on the

Mammifera," and the "*A. rufescens* of M. Selys-Longchamps." The first specimen which Mr Yarrell obtained was from Birchanger, in Essex. Two other examples were sent from the same locality; and specimens were subsequently received from Hertfordshire, Middlesex, and Berkshire. Mr Jenyns has found it in Cambridgeshire, and Mr Bell has received it from Hertfordshire. I have examined specimens found by Mr Weir near Bathgate, in the county of Linlithgow, but which were mistaken for *A. agrestis*, until I pointed out the differences between them and that species. It has also been found by Mr Lizars near Kelso, and the individual represented in the plate, from that locality, and erroneously named Short-Tailed Campagnol, appears to have been of the same species.

The Meadow Vole is considerably less than the Field Vole, which it, however, resembles in form. It differs from that species in having the tail proportionally longer, the colour of the upper parts bright-red in place of reddish-brown, and the lower parts, including that of the tail, yellowish-white. The incisors are of the same colour as those of the more common species; and the differences in the feet are so slight as not to be easily described; but the ears are a little more prominent. The fur is soft, and rather long, of a bright chestnut-red above, yellowish-grey on the sides, cream-coloured beneath; the feet and claws are yellowish-white, as is the lower surface of the tail, of which the hairs are somewhat longer than those of the other species,

and those at its extremity project more conspicuously.

	Inches.	Lines.
Length to end of tail	5	2
——— of head	1	1
——— body	3	5
——— tail	1	9
Ear from base to apex	0	6½

THE COMMON HARE.

Lepus timidus.—Linn.

PLATE XXX.

Ears as long as the head, black at the tip; upper parts light yellowish-brown, mixed with black, and posteriorly tinged with grey; fore part of neck light yellowish-red; tail black above, white beneath.

Lepus timidus. Linn. Syst. Nat. I. 77; Desmar. Mammal. 347; Jenyns, Brit. Vert. Anim. 34; Bell, Brit. Quadr. 333.

The genus Lepus, which includes the animals designated in common language by the names of Hares and Rabbits, is characterized by a peculiarity in the incisors of the upper jaw, which have behind them two smaller teeth nearly of the same form; by the flattened summits and transversely disposed plates of enamel of the grinders, of which there are six above and five below on each side, by a tuft of hairs on the inside of the cheeks; by the elongation of the ears, and the abbreviation and recurvature of the tail. Three species occur in Britain, and another is peculiar to Ireland.

HARE

The Common Hare of this country and of the Continent of Europe, *Lepus timidus* of Linnæus, presents the following characters: The body is large, compressed, and deep; the neck very short; the head of moderate size, convex above, broad and obtuse in front, the nose being depressed, the lips tumid, and separated by a deep incision; the eyes very large, prominent, and situated laterally; the ears of the same length as the head, narrow, deeply concave, with the tip rounded. The hind limbs are much longer, and have only four toes, while there are five on the anterior; the soles of all are covered with hair; the claws rather long, slightly arched, compressed, rather acute, but those of the hind feet blunted in older individuals. The tail is very short and recurved. The fur is of two kinds, as in all the species of this genus; the longer hairs are very slender at the base, enlarged towards the end, acuminate and recurved, and intermixed with still longer straight hairs; the shorter extremely fine and tortuous. On the feet the longer hairs predominate, and are straightish, adpressed, and rather stiff; on the ears they are short; on the nape wanting. The mystachial bristles are long, faintly undulated on two opposite sides, disposed in several series, the lower forming a tuft; five or six long bristles arise over the eye; and there are some shorter beneath it. The hair on the lower parts is longer, on the tail soft and woolly. The fore part of the mouth within is covered with stiffish woolly hairs. The upper parts are light yellowish-brown, mingled with

dusky on the back and sides, and with grey on the hind quarters; the fore part of the neck, and a portion of the breast, are dull light yellowish-red, as are the feet, and part of the flanks; the abdomen, inside of the thighs, and a large patch on the throat, are white; there is a whitish line over the eye, and a patch of greyish-white before it; the ears are pale yellowish-red on their anterior margin externally, dusky, intermixed with yellowish-red, on their anterior half, whitish on the posterior, with a patch of black at the end; internally with whitish hairs at the base, dusky at the middle of their posterior margin, reddish-white in the rest of their extent, excepting the margin of the tip, which is black. The tail is black above or anteriorly, white beneath, or rather behind, as it is recurved. On the upper parts the hair is greyish-white, sometimes pure white, at the base, dusky beyond the middle, and yellowish-brown at the end; the elongated slender hairs are black, but on the sides of the body and the lower parts reddish or white. The fur or fine hairs white, with the extremity dusky.

	Inches.
Length to end of tail	26
—— of head	5
—— tail	3½
—— ears	4¾
—— from olecranon to end of middle claw	8
—— heel to end of second claw	5½

The Common Hare is generally distributed in Britain, but does not occur in Ireland, where, however, another species of nearly the same size is found. It feeds entirely on vegetable substances, such as grass, clover, corn, turnips, and the bark of young trees, sometimes inflicting great injury on the latter, especially in winter. Towards evening it comes abroad in quest of food, and continues to search for it during the night, in conformity with which habit its pupil is large, and of an oblong form. It advances by leaps, and as its hind legs are much longer than the anterior, it runs with more ease up an inclined plane than down a declivity, especially if it be steep. During the day it reposes in a crouching or half sitting posture in its form, which is a selected spot usually resorted to by it, among grass or ferns, or in the midst of whins or other shrubs. Its senses of seeing and hearing are extremely acute; its eyes being placed directly on the sides of the head, take in a wide range, and its large ears can be readily turned in any direction forwards, outwards, or backwards, so as to catch the smallest sounds indicative of hostility. Being in a manner defenceless, and having no burrow or fastness to which it may retreat, it trusts to its vigilance and great speed to enable it to elude its numerous enemies. The excellence of its flesh makes it liable to be destroyed by persons of all degrees, and its frequent occurrence, extreme timidity, and great speed, render it a favourite object of the chase among those of equestrian rank who,

for the gratification of their destructive propensities and love of excitement, are willing to indulge in a pursuit as unmanly as it is cruel.

It is chiefly to the lower and more cultivated districts that the Common Hare resorts; but it is also found in the upland valleys, and on the slopes of hills at a considerable height. Timid and gentle as it is, it is by no means innocuous, for the injury it occasions to the young corn is often considerable. In winter it finds an abundant supply of food in the turnip fields, and sometimes visits the gardens at night, especially when urged by hunger during continued frost. It has been observed to cross rivers by swimming, and even to enter the sea for the purpose of gaining an island or point of land, on which its food was more abundant.

The female goes with young thirty days, and several times in the season produces from three to five young ones, which are born covered with hair, having their eyes open, and capable of running. The young squat in the fields, remaining motionless, like those of many of the Grallæ, and are with difficulty perceived. Even the old Hares are not readily driven from their form, in which they will sometimes remain until a person is quite close to them, when they at length start off, exhibiting in their motions the haste and perturbation of extreme fear. The timidity of the Hare is indeed proverbial, as is its propensity to return when wounded, or even when hunted, to its usual place of repose. Besides being pursued with hounds, and shot for pastime, it is

snared in its form or in the paths which it has made in the herbage. Its flesh is superior in flavour to that of the White Hare or the Rabbit; and its fur is in request for various purposes, especially the manufacture of hats. Large individuals weigh from nine to twelve pounds, but the ordinary weight is about eight.

THE IRISH HARE.

Lepus Hibernicus.—Bell.

Ears shorter than the head; black at the tip; upper parts light brownish-red; fore part of neck dull greyish-red; tail white.

Irish Hare. Yarrel in Proceedings of Zoological Society for 1833, p. 88. Lepus timidus, var. 5, Jenyns, Brit. Vert. Anim. 35. Lepus Hibernicus, Bell, Brit. Quadr. 341.

The Irish Hare differs from the Common in having the ears proportionally shorter, the general colour of the upper parts of a nearly uniform light brownish-red; and the tail destitute of black on its upper or anterior part. Other points of difference will be detected on comparing the descriptions of the two

species. The form and proportions are in general similar to those of the Common Hare, but the head is somewhat shorter, as are the limbs, although I do not find that the hind legs are proportionally less elongated, as has been represented. The head is convex above, broad and rounded in front, the ears about a fourth shorter than the head; the hind feet with four, the fore feet with five toes; the claws long, slightly arched, compressed, those of the hind feet stronger. The mystachial bristles are as in the Common Hare, but much shorter, and not undulated. The fur is not as represented by authors, but in all essential respects similar to that of the Common Hare; although the long hairs are less strong and curved. They are grey at the base, then black, with a yellowish-red space towards the end, the tip black. Intermixed are scattered longer hairs, which are entirely black. The woolly hairs or under-fur are grey at the base, light red at the end. The ears are externally reddish on their inner half, greyish-white on the outer, the tip black, their inside reddish on the outer edge, the tip black. All the upper parts are light brownish-red; the throat greyish-white, the fore part of the neck dull greyish-red; the lower parts, the inside of the legs, and the greater part of the hind feet, white, the claws greyish-yellow.

	Inches.
Length to end of tail	24
——of head	5
——tail	3¼
——ear	4
——from heel to end of claws	5¾

The above description is from nature, and differs from that of Mr Bell, who says—"The character of the fur is also remarkably different, (from that of the Common Hare:) it is composed exclusively of the uniform soft and shorter hairs which in the English (and Scottish) species is mixed with the black-tipped long hairs, which give the peculiar mottled appearance of that animal; it is therefore of a uniform reddish-brown colour on the back and sides." The hairs, as I have stated, are as in the Common species: namely, woolly hairs or under-fur, long hairs or pile, and still longer and more slender hairs; and the darker colour of that species is chiefly caused by the under-fur, which, in place of being red at the end, as in the Irish Hare, is black. In the latter, the fur is shorter, and therefore less valuable.

This animal seems to have been discovered in Liverpool, in 1833, by the Earl of Derby, who sent a specimen to the Linnæan Society, which was subsequently described by Mr Yarrel. Mr Bell first admitted it as a distinct species. It appears to me to be fully as much allied to the Varying as to the Common Hare, although it does not become white in winter like the former.

THE WHITE OR CHANGING HARE.

Lepus variabilis.—PALLAS.

PLATE XXXI.

Ears one-third shorter than the head, black at the tip; tail white. In summer, the head reddish-brown, the lips and chin brownish-white, the ears dusky, the upper parts dull greyish-black, intermixed with reddish, the fore part of the neck dusky-grey. In winter, the general colour white, with long blackish hairs on the upper parts.

Lepus variabilis, Desmar. Mammal. p. 349. Lepus albus, Jenyns, Brit. Vert. Anim. 35. Lepus variabilis, Bell, Brit. Quadr. 343.

THE White Hare is considerably smaller than the Common and Irish Hares, which, however, it resembles in form, although it has the ears and hind legs proportionally shorter. The number of toes, and the nature of the fur, are the same as in the other species; but the latter is softer and more woolly. In the middle of summer, the head is reddish-brown, the lips and chin brownish-white, the ears dusky on their anterior half, greyish on the posterior, with the

tip black; the nape whitish; the general colour of the upper parts is dull greyish-black, intermixed with reddish. The long hairs are grey at the base, then black, with a small portion of a yellowish tint, the tip black. Some of the longer hairs are entirely black. The fine hairs or under-fur are light-grey at the base, pale reddish-brown at the end. The tail is greyish-white. The lower parts are greyish-white, as are the legs over the greater part of their extent; the toes brown; the claws dusky.

	Inches.
Length to end of tail	23
——— of head	4¾
——— tail	3½
——— ears	3½
——— from heel to end of claws	5½

In September the colours begin to assume a paler tint, many of the dusky hairs having disappeared. In October the change is farther advanced, and, towards the end of that month, the muzzle, hind neck, and feet, are white, of which there are spots and patches dispersed here and there. In December the fur seems entirely white, but has an intermixture of long blackish hairs on the back; the anterior external part of the ear is brownish, and its tip black. The under-fur is light bluish-grey at the base, pale yellowish or cream-colour towards the end. The account of the change of colour given in the Edinburgh Philosophical Journal, Vol. II. p. 191, seems to me incorrect, although very methodical and pre-

cise. From the examination of individuals at different periods of the year, I have inferred that in this species the hair is almost always changing; that in April and May there is a general but gradual shedding, after which the summer colours are seen in perfection; that towards the middle of autumn many new white hairs have been substituted for coloured ones, and that, by degrees, all the hairs and underfur are shed and renewed before the end of December, when the fur is in the perfection of its winter condition, being closer, fuller, and longer than in summer.

The White Hare is not uncommon in the middle and northern divisions of Scotland, residing in the valleys of the Grampians and other mountainous tracts, but not ascending the hills to their summits, although in summer it keeps on the ferny slopes. It appears that this species occurs also in some of the northern parts of England. In winter, it descends to the bottom of the valleys, but never visits the lower districts. It does not burrow, but conceals itself among the ferns or heath, often in stony or rocky places. Its flesh is whiter than that of the Common Hare, generally leaner, and therefore less esteemed. It is said to be easily domesticated if taken young, and to exhibit less timidity and more playfulness than the Common Hare.

An adult male from Perthshire presented the following dimensions:—

	Inches.
Length to end of tail	23
Depth of body	6
Ears	4
Tibia	6
From heel to point of claw	5¾
Cubitus	4¾
Fore-foot	2¾

THE RABBIT OR BURROWING HARE.

Lepus Cuniculus.—Linn.

PLATE XXXII.

Ears about a fourth shorter than the head, with a blackish tip; upper parts brownish-grey, mixed with yellowish-red; throat and lower parts white; tail extremely short, black or brown above, white beneath.

Lepus Cuniculus. Linn. Syst. Nat. I. 72; Desmar. Mammal. 348; Jenyns, Brit. Vert. Anim. 35; Bell, Brit. Quadr. 348.

The Rabbit is the smallest British species of the Hare genus. It differs from the rest in having the limbs proportionally shorter, and in betaking itself to subterraneous retreats, which it digs for itself in the soil. Common as this animal is in most parts of the country, the distinctive characters given to it in our most recent works are erroneous. Thus, the ears are said to be as long as the head, whereas they are an inch shorter; they are represented as having no black spot at the tip, which is true only in so far as the black colour there is expanded over

RABBIT

a semilunar space; and the tail is alleged to be brown above, whereas it is generally black. However, no one can mistake the Rabbit, which is a very common, pretty, and lively animal, of which domesticated individuals are favourite pets with the juvenile part of the community.

The head of this species is of ordinary size, the forehead convex, the muzzle rounded, the nose flattened, the upper lip slit, the mouth small, as are the nostrils, the eyes large and full, the ears approximated, oblong, rounded at the end. The body is full and deep; the fore limbs short, the others long; the tail very short and recurved. There are five toes before, four behind; the claws compressed, rather long, slender, channelled, and acutely marginate beneath, those of the fore feet more slender. The pile or fur consists of two kinds of hairs. The under-fur is greyish-blue, tipped on the upper parts of the body with light reddish-brown, on the lower, where it is coarser, with whitish. On the back of the neck, where it is light reddish-brown, it exists alone; as well as on the soles, where it is coarse, thick, and woolly; in the intrafemoral regions; and, with very little mixture, on the tail. The general colour of the upper parts is light reddish-brown, tinged with grey, and mixed with brownish-black. The mystachial bristles are black; four or five of them white, excepting the base and tip. The lower parts are greyish-white; the breast and a line to the inguinal region tinged with light reddish-brown, of which colour is a broad band in the inguinal re-

gion; the perinæal white, as is the lower surface of the tail, the upper being black or blackish-grey. The feet are reddish-brown, with an internal band on each brownish-white; the claws dark-brown, tipped with paler. The ears are light brownish-red behind, in their anterior half light yellowish-brown mixed with blackish; brownish-black towards the tip, their margins all round yellowish-grey.

	Inches.
Length to end of tail	20
Tail with the hair	3
Head	4½
Ears	3½
Girth behind the shoulders	9
Depth of the chest	4
Height at the shoulders	6½
——— rump	8
From heel to end of claws	4½

The female is smaller than the male, but of the same colour. The young are similar in colouring to the adult, but considerably lighter. The upper surface of the tail is like the back, although dark at the roots of the hairs; the brownish line down the breast is wanting. The female has three mammæ on each side.

The Rabbit, although not an indigenous animal, is generally distributed in Britain, being fostered on account of its flesh, which affords an agreeable and wholesome article of food, and its fur, which is used for various purposes. The places most favourable to it are sandy heaths or downs, overgrown with

coarse grass and furze, the latter plant not only affording shelter but also food. There it congregates in vast numbers, digging burrows in the soil, in which it reposes, and to which it retreats from danger. Although, on account of the comparative shortness of its legs, it is much inferior to the Hares in speed, it yet runs with great celerity; and a number of Rabbits scattered over a field, and retreating, on being alarmed, to their holes, afford a very pleasant sight, some scudding along in trepidation, others bounding over the shrubs or herbage, one disappearing here, another stopping a moment to look around before it plunges into its retreat, and perhaps a third peeping from the aperture. Early in the morning, when old and young are abroad, they may be seen gamboling in fancied security, for the Rabbit is "full of fun and frolic," and takes pleasure in exercising its faculties. If there are fields and pastures in the neighbourhood, they make excursions among the corn and grass, committing serious devastations when their numbers are great, so that the vicinity of a warren is a great nuisance to the farmer. Foxes, Polecats, Ermines, Weasels, and various birds of prey, destroy considerable numbers; but as their fecundity is great, they rapidly increase in spite of "natural enemies." It is Man alone, the arch-destroyer, that is capable of thinning a warren to purpose, or of extirpating it. At the age of six or eight months it is capable of propagating; and as it produces from five to eight several times in the year, it has a tendency to over-

stock the grounds allotted to it. Vast numbers are killed every year, to be sold in the markets, being caught in snares, often with the aid of Ferrets, which entering their holes, muzzled, drive them forth into the nooses prepared for them. They are also shot for the same purpose, often for mere amusement. In the wild state Rabbits are not polygamous, but pair, and, it is said, remain thus attached for life. The female, when about to deposit her young, forms a separate burrow, and makes a nest for their reception of the fur plucked from her breast. Unlike the young of the Hare, they are blind and naked at birth; but they grow rapidly, soon come abroad, and are in a short time able to shift for themselves.

In the domesticated state, the Rabbit very rarely exhibits its natural colours, but presents a great variety of hues, some being pure white with pink eyes, and therefore true albinoes, others black or melanites. In a breed, much esteemed by fanciers, the ears become greatly elongated, and droop in various degrees; but in this state the Rabbit, overgrown and stupified, is as much inferior to the wild breed, as the monstrous cropper is to the active and truly beautiful rock-dove. Sometimes the hair becomes excessively elongated; and a breed of this kind formerly existed in the Isle of May in the mouth of the Frith of Forth.

RUMINATING QUADRUPEDS.

The Ruminantia, so named on account of the singular faculty which they possess, of bringing back from the stomach the food which they have hastily swallowed, and submitting it to a second mastication in the mouth, constitute one of the most natural groups of the Mammalia. Their stomach is divided into four cavities, of which the first or largest is named the paunch; the second small, and having its inner or mucous coat raised into numerous folds, forming polygonal cells, is the honey-comb; the third, smaller than the second, is named manyplies, on account of the prominent longitudinal plaits of its inner coat; and the fourth, larger and more elongated than the latter two, is the rennet or true stomach, in which milk is coagulated, and the food reduced to a pulp. The paunch, manyplies, and honeycomb, communicate directly with the œsophagus, from which to the manyplies the passage is a

kind of canal passing over the honey-comb. When a mass of coarse food is swallowed, it obliterates this canal, and passes directly into the first stomach or paunch; but when a fluid or well masticated food passes down the gullet, it glides along the canal into the third cavity or manyplies, whence it afterwards proceeds into the fourth stomach. The food of these animals, hastily cropped, and imperfectly masticated, passes at first into the paunch and honey-comb, from which, when the animal ceases grazing, it is regurgitated in pellets into the mouth, and being there properly comminuted and well mixed with saliva, passes directly into the manyplies and true stomach. Another peculiarity of most of the Ruminantia is their having no incisors in the upper jaw; but a family composed of the Camels and Lamas form an exception in this respect, as well as in having several hoofs, whereas the rest have only two, although there are two more of smaller size, and elevated from the ground, on each foot.

The eyes are generally large, prominent, and lateral, with oblong, transverse or oblique pupils; the ears elongated, and possessed of great mobility; the nostrils terminal and large. Some of them are destitute of horns; but the greater number are furnished with those appendages, which are either agglutinated hairs, forming a conical sheath to a bony core, as in the Cow; or osseous processes from the frontal bone, which are renewed yearly, as in the Stag. The flesh of the Ruminantia is supe-

rior to that of the other tribes as food, and their milk is more abundant and nutritious. Their skins form the best kinds of leather; their horns, hoofs, and hair or wool, are applied to many purposes in the arts; and they are to man the most important, in an economical point of view, of all the tribes of the Mammalia.

The families into which this order may be divided are those composed of the Camels, which are destitute of horns, and are furnished with incisors in the upper jaw; the Giraffes, which have horns permanently covered with skin; the Bulls, Buffaloes, Sheep, Goats, and Antelopes, which have true horns, moulded upon a bony core; the Deer, which are furnished with bony horns or antlers, annually renewed; and the Musk-Deer, which are destitute of horns and upper canine teeth, and furnished with long incisors in the upper jaw. Of these groups there are in Britain representatives of only that composed of the Deer, and of them only two species, the Red Deer and the Roe.

THE DEER.

These animals are generally characterized by their light and graceful forms, their slender and elongated limbs, short tail, and stiffish hair. The males are furnished with antlers, which exist in the female of only one species, the Rein-Deer. These appendages are produced and obliterated in a very simple manner. Two protuberances appear on the forehead, which gradually enlarge, carrying with them the skin, which is abundantly supplied with blood by the vessels that furrow the surface of the callous mass. At the base of the latter an annular protuberance or rim is formed, by which the vessels are gradually obstructed; whereupon the supply of blood ceasing, the skin dies, and comes off in shreds, leaving the bony horn or antler exposed. In this state it continues for several months; but, as all bones, when exposed to the action of the air, become necrosed or die, the antlers at length cease to be connected with the system by any organic union, and ultimately fall off, leaving a rough and bleeding surface, which is soon covered with a thin pellicle.

A new prolongation now takes place, and the antler shoots out, covered with skin and hair, but destined to be shed and renewed in the same manner. At each successive renewal it generally becomes more elongated, but in old age it ceases to enlarge, or even diminishes, and the size of the horn varies in the different species, being in some extremely elongated, with numerous branches, in others very short, and almost simple. In some the horns are flattened and palmated, as in the Fallow Deer kept in our parks; while in others the shaft and branches are round. Our two native species of Deer have horns of the latter kind.

THE RED DEER OR STAG.

Cervus Elaphus.—Linn.

PLATE XXXIII.

Horns elongated, round, diverging, incurvate, with several branches or antlers, of which three are directed forwards; hairs tubular, stiffish, brittle; upper parts reddish-brown, lower grey, hind parts white.

Cervus Elaphus, Linn. Syst. Nat. I. 93; Desmar. Mammal. 434; Jenyns, Brit. Vert. Anim. 37; Bell, Brit. Quadr. 394.

The Red Deer is considered as the noblest of our indigenous animals by those who estimate nobility by bulk, or some undefined qualities, which, judging from the objects usually so designated, can scarcely be recognised. Thus, the Eagle, a large, rather cowardly bird, is said to be noble; as are the Jer Falcon and Peregrine, which, although not very large, are full of courage; and the Bustard, which has no courage at all. The Stag is almost as timid as a Hare, and therefore cannot claim nobility unless on account of his size, or his pre-eminence as a

beast of chase or of "venerie." For obstinate valour, the Badger, and for audacity, the Ermine, are certainly the most renowned of our native quadrupeds. But as regal game the Red Deer may be properly enough styled noble or royal; and the laws enacted for its preservation by the Conqueror of England show that, in the eyes of some, a wild beast may be of more value than a human being. "The afforesting of vast tracts of country," says Mr Bell, "by which not only single cottages were destroyed, but whole villages swept away, and churches desecrated and demolished, was the fertile source of misery to the poorer inhabitants, and of injustice to the ancient proprietors of the soil; and the cruel inflictions of the oppressive laws which were enacted to preserve the Deer, increased tenfold the curse arising from this tyrannical passion for the chase; for it was a crime less severely penal to kill a man than to destroy or take a Deer." The proprietors in the north of Scotland were scarcely less tyrannical thirty or forty years ago, and I have heard of instances of despotism connected with this animal that would sound strangely in the ears of Englishmen of the present day. However, all the restrictions and penalties imposed were not sufficient to prevent the annual slaughter of hundreds of Deer; and I know a man residing in the Island of Lewis who killed from ten to twenty every year.

After all, the Red Deer is a stately and beautiful animal, as a subject of sport certainly the noblest of our native quadrupeds. See him on the granitic

ridge of Ben-na-buird, snuffing the tainted breeze as you approach, tossing his antlered head on high, starting off with rapid bounds, and hastening away to the distant corry, where his comrades are reposing in fancied security. Or, having spied, whether with the aid of a glass or not, a herd of Stags at the distance of a mile or more, let us, passing behind the eminences, gliding down the torrent-ruts, creeping among the tufts of peat and heather, cautiously come upon them against the wind, and gently putting aside the coarse grass, peep out upon them as they graze on the green margin of the mountain rill. Not a word must now be spoken, not even a whisper; the click of your lock has started that grey-throated chief; but he hears not the report of the gun, for the bullet has pierced his heart, and there, when you have reached the spot, with the beating breast and hurried breathings of eager hope, you find extended the victim of your insatiable desire of slaughter. Or again, in that thicket of stinted hazel and brambles, on the slope of the long heath-clad valley, is the lord of the soil, with a number of his friends, skulking with their rifles, and gazing anxiously on the distant ridge, on which they expect ere long to see the antlered herd driven by the forest-keepers and their people. There, one after one, now masses, and straggling parties, obscurely seen in the dim haze, appear for a moment against the sky, and plunge down the slope. They have disappeared, but presently are seen on the heights their pursuers, who, scattered

along the eminences, hem them in so that they must pass along the narrow gap in front of the liers in wait. Now bursts on the view a band of old Stags, hastening along with light bounds; in their rear is a promiscuous assemblage of Deer of all ages; they sweep through the pass; shot after shot is fired; some have fallen, and many have fled; but the sport is only for the noble; and we, who are more dependent upon our own exertions, may content ourselves with meaner game. In the Deer-forest of the Duke of Atholl, I have seen more than five hundred individuals in one herd; and in that of the Earl of Fife in Braemar, at least two hundred. In many of the wilder districts of the middle and northern divisions of Scotland, the species is still not uncommon, as well as in a few of the larger islands, especially Skye, Lewis, and Harris, in the latter of which, having permission from the proprietor, I many years ago shot two. Wild and vigilant as the Red Deer is, I have yet crawled to within ten paces of one, and in those parts where there are neither woods nor thickets, this is the only way in which they can be obtained. When you have fired from your concealment, the herd immediately start off, gathering into a close body as they proceed, and at the distance of from two to five hundred paces, invariably turn and stand for a few seconds, to discover whence the noise has come. It is chiefly in the morning and evening that they feed, and during a great part of the day they repose among the heath. In summer the males keep apart

from the females, feeding singly, or in small herds, on the higher parts of the hills; the Does with their young preferring the valleys, unless they are much disturbed. In August the Stags separate, commence their rambles, fight with each other, bellow at night, and pursue the females. When this season of excitement, which lasts about a month, is over, they are quite emaciated, and for a time seem dejected; their animosity towards each other ceases, and they feed in peace, as if anxious to recruit their wasted energies before the severity of winter commences. After the middle of that month the Stags are not worth shooting, but the Hinds continue in good condition until the end of December. The young are produced early in May, the period of gestation being a little more than eight months. It is very seldom that there is more than one at a birth. They are of a light-red colour, dappled with white, are able to run about in a few days, but for some weeks lie concealed among the grass or heath, the Hind coming to suckle them at intervals.

The young male in the first autumn has only small protuberances on the forehead, technically termed knobs. In the second year, being longer and pointed, they are named dags; in the third year the brow antler appears; in the fourth the second or bez antler; in the fifth the third or royal antler; and in the sixth the crown or surroyal. In succeeding years branches are added to the crown, until, in some individuals, there are six or eight

branches on each horn. In old individuals it appears, however, that the number of crown branches diminishes. The horns are shed in February, and the new ones completed by the beginning of August, or previous to the commencement of the rutting season. Whatever purpose they fulfil in the economy of the animal, it is evident that they are not given merely as weapons of defence; for the Hinds, which are deserted by the Stags when they most require protection for themselves and their young, are not furnished with any.

A full-grown Stag measures four feet six inches in height at the shoulders; the length of the head is eighteen inches, that of the neck and body five feet five inches, and that of the tail six inches. The body is moderately full, and rounded; the neck of moderate length, the head tapering to the obtuse muzzle, the eyes large and full, the ears rather long and pointed; the limbs slender, the tail short. The fur consists of both bristly and woolly hairs; the former predominant, pretty long and close, the latter in small quantity, short and fine. Each of the long hairs is spirally twisted, which gives it the appearance of being undulated; it is stiffish, filled with a kind of pith, pointed at the extremity, attenuated at the base, and very easily broken across. The hair is thinnest on the belly, longest on the buttocks and back, and more especially on the fore part of the neck, very short on the feet and muzzle. The general colour of the body is yellowish-red, mixed with dark-brown, the hairs, which are pale

at the root, being of a light purplish-brown tint, which deepens upwards, and tipped with pale yellowish-brown. Along the ridge of the back the colour is darkest; and on the lower parts it changes to greyish-white, slightly tinged with yellow. The tail, and a considerable space around it on the haunches, pale yellowish-red, the perinæum greyish-white. The broad line of deep colour down the back separates above the tail into two, (sending a small line from the bifurcation toward the tail,) which mark the outer edge of the pale yellowish-red patch. On the upper part of the limbs, the yellowish-red diminishes quickly, being substituted by a paler tint, and below the (so called) knees, where the hair becomes finer, the colour is a light greyish-brown. The face is a mixture of this brown with the general colour, the muzzle being chiefly of the former, the forehead of the latter. The cheeks are brownish-grey, the hairs being tipped with greyish-white; there is a whitish space about the eyes; the eyelashes are black; there is a number of dark-brown bristles along the eyebrows, and a few below the eye; the mystachial bristles are few and spare, short, pliant, and dark-brown. The ears are greyish; the fore part of the neck grey, the hairs being tipped with greyish-white. The hoofs and hooflets are blackish.

The flesh of the Red Deer is by some said to be inferior to that of the semi-domesticated Fallow Deer; but in my opinion it is excellent, and possesses a fine flavour; although in the old males

it is usually tough, the muscles, especially of the limbs, being remarkably rigid. The fat is very firm, and of a larger grain than that of the Ox. The horns are applied to various purposes, but are chiefly used in the manufacture of handles for knives.

THE ROE DEER.

Cervus Capreolus.—Linn.

PLATE XXXIV.

Horns round, small, erect, with the extremity forked, and the first antler directed forwards; tail extremely short; upper parts yellowish-brown, lower pale yellowish-grey.

Cervus Capreolus. Linn. Syst. Nat. I. 94; Desmar. Mammal. 439; Jenyns, Brit. Vert. Anim. 38; Bell, Brit. Quadr. 407.

The Roe is much inferior in size to the Red Deer, which it, however, excels in activity. While with us the latter prefers the remote and bare valleys of the mountainous districts, seldom betaking itself to woods, and thriving in districts where scarcely a bush is to be seen, the former seldom ventures to appear in open pastures, but resides in thickets and dense woods. In most parts of the Highlands of Scotland it is not very uncommon; in the southern districts of the same country it is occasionally met with; and in the woods and copses of the northern counties of England it is rather plentiful. This

PLATE 51

THE RED DEER.

species never forms large herds like the Red Deer, but is usually met with in pairs, or three together, the male remaining with his mate all the year. Its agility is astonishing, for it will bound over a space of eight or ten yards with ease, and leap a wall five or six feet high with scarcely an appearance of effort. Its ordinary pace when not pursued is an easy canter, but when alarmed it bounds along with great spirit and grace. It feeds chiefly in the morning and evening, often also at night, when it sometimes commits depredations on the corn-fields in the neighbourhood of its haunts, and reposes by day among the heath or fern, often, when not liable to be much disturbed, selecting a spot to which it resorts in continuance. The rutting season is in the end of October, and the young, generally one, but sometimes two, are produced in the beginning of April. The fawn is concealed in the thickets for some weeks, remaining crouched among the herbage during the absence of its mother. It is of a reddish-brown colour above, spotted with white in irregular longitudinal bands. The young males have merely tubercles the first year, a simple pointed snag the second, an anterior antler the third, an antler and a forked extremity the fourth; beyond this period there are no additional branches, but the horns increase in size until the seventh or eighth year. Towards the end of autumn the young separate from the parents, remaining single or in small groups until the next pairing season. The Roe is usually shot in its haunts, sometimes by persons stationed

at the passes through which it is wont to issue when pursued. Its flesh is dark-coloured, and rather dry, and is not so much esteemed as that of the Red Deer.

The Roe is one of the most elegantly formed of our native quadrupeds: its body is moderately full, the limbs long and slender, the neck of moderate length and rather thick, the head tapering, the muzzle rather narrow, the eyes large and full, the ears long and pointed, the tail extremely short, not being apparent among the fur. The hair is close, stiff, of moderate length, in texture and form resembling that of the Red Deer, being undulated, and internally spongy or cellular, with a slight intermixture of short woolly hairs. The undulated hairs are light purplish-grey for three-fourths of their length, then dusky, with the tip light yellowish-brown. The upper parts are of a yellowish-brown colour, or of a minute intermixture of dusky and yellowish-brown; the hind neck and broad band along the back darker; the sides of the head and neck light yellowish-grey, as are the lower parts of the body; the inner sides of the limbs, and the feet. The lips are whitish, as is a large space under the tail, conspicuous, when the animal is seen running, by its contrast with the colour of the upper parts. The ears are of the general colour on their back part, the long woolly hairs of the inner or anterior surface reddish-white, their terminal margin black.

	Inches.
Length of head	6
—— neck	10
—— body	26
—— tail	1
—— ears	5
Height at the shoulder	25

The female is of a lighter colour than the male, and considerably inferior in size. The young in autumn is yellowish-red, with several longitudinal series of whitish spots.

APPENDIX.

The Rev. Leonard Jenyns, in a second paper on the British Shrews, published in the Annals of Natural History, Vol. I. p. 417, has described four species, of which one is new to Britain. The names and specific characters which he assigns to them are as follows:—

1. *Sorex rusticus*, Jen. *Common Shrew.* Snout and feet slender; tail moderately stout, nearly cylindrical, not attenuated at the tip, well clothed with hairs, which are very divergent in the young state, and never closely appressed.

This is the Common Shrew of the present work, p. 123.

2. *S. tetragonurus*, Herm. *Square-tailed Shrew.* Snout broader than in the last species; feet, fore especially, much larger; tail slender, more quadrangular at all ages, and slightly attenuated at the tip; clothed with closely appressed hairs in the young state, in age nearly naked.

3. *S. fodiens*, Gmel. *Water Shrew.* Deep brownish-black above, nearly white beneath, the two colours distinctly separated on the sides; feet and tail ciliated with white hairs.

This is the species described under the same name at p. 126 of this manual.

4. *S. ciliatus*, Low. *Ciliated Shrew.* Black above, greyish-black beneath; throat yellowish-ash; feet and tail strongly ciliated with greyish hairs.

The Oared Shrew, *S. remifer*, described at p. 130, is the same as the present.

Including *Sorex tetragonurus*, and rejecting the Beech Marten and Black Water Vole as species distinct from the Pine Marten and Common Water-Rat, as well as *Plecotus brevimanus*, which is supposed to be specifically identical with *P. auritus*, we thus find that the number of British Quadrupeds is fifty. Although their habits cannot so easily be studied as those of birds, nor specimens of many species readily procured in any particular district, they constitute a most interesting portion of our Fauna, the complete elucidation of which is yet a desideratum in our scientific literature. The Bats, Shrews, Seals, and Mice, are the groups in which discoveries more probably remain to be made.

It is to be regretted that some mistakes have been made in the numbering and naming of a few of the Plates. Plate III., representing the Long-eared Bat, ought to have been Plate II.; Plate IV., representing Daubenton's Bat, ought to have been Plate III.; and the reference has been omitted at p. 10 to the Plate which is numbered as the second.

EDINBURGH:
PRINTED BY W. H. LIZARS.

00087651

Digitized with financial assistance from the
Government of Maharashtra
on 15 March, 2016